Gas Journal

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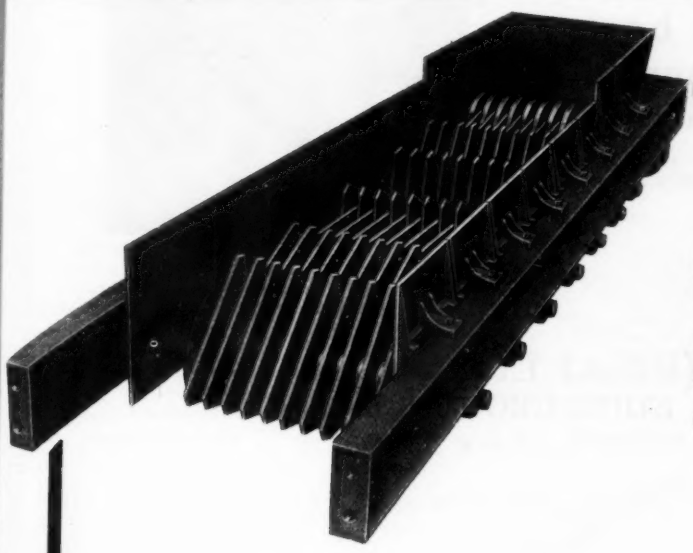

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Gas Journal

FEBRUARY 6, 1935

Vol. 209. 87th Year No. 3742.

Editorial Notes

Confidence

In recent issues we have been asking the personnel of the Gas Industry, from the highest executive to the humblest worker, to have greater confidence in the future of gas and to show this confidence in practical form.

The public certainly have confidence, and we hope that the lukewarm members of the Gas Industry will get a kick out of the result of the recent debenture issue of the Gas Light and Coke Company. On Wednesday last the prospectus was published of the issue of £2,500,000 3% consolidated debenture stock of the Company. There is already in existence £6,102,000 of similar stock, and including two issues of redeemable stock the Company's total loan capital outstanding is £13,245,000. The stock was offered at £93 10s.%, at which the yield is £3 4s. 2d.%.

By ten o'clock on the following morning the lists had been opened and closed, with the issue already oversubscribed.

"Confidence; Attractive Tariffs" is the motto we have put forward for 1935. Given confidence, we can make attractive tariffs still more attractive by reducing the cost of gas into holder, and we urge those who are contemplating the installation of new plant of whatever description, or the bringing of existing plant up to date, not to procrastinate. Moreover, our appeal goes beyond those "who are contemplating;" it seems to us, for various reasons, very much the time *to contemplate*. We do not suggest that gas undertakings should forthwith erect new holders, gas making plant, and all the other apparatus which have made such strides in design and efficiency since the War, purely as monuments to demonstrate their confidence to the public. We do believe, however, that such demonstrations in cases where they are justified would do a power of good, and we do know that many a gas engineer would feel happier in his mind if he could persuade his Committee or his Board that certain improvements really are overdue.

Plant and Equipment

More contractors and appliance makers than ever are displaying confidence by their announcements in our advertisement columns week by week, and as far as it can be reflected in print the modernity of their outlook is, in the majority of cases, clearly shown in their displays. The Gas Industry, we sincerely believe, is served truly well by its contractors. We have lately been at pains to sound the views of some of them whom we regard as representative, and we give it as our opinion that undue delay by gas undertakings in the contemplation of necessary work is more than likely to result in eventual financial loss to the undertakings.

With the general improvement in trade, factors which are beyond the control of our own particular contractors are tending so rapidly to make this inevitable. Prices of iron and steel and bricks—indeed of practically every raw material used in the manufacture of gas-works plant—have hardened and are hardening, and there is little doubt that this hardening tendency will be accelerated in the near future. And there is another important consideration to take into account. As more work gets into the shops of the heavy industries which contribute their quota to gas-works plant as well as to that of other trades, this inevitably means that the length of time between order and delivery will increase. Gas undertakings which have prided themselves on looking ahead during the past few years will have to look still farther ahead now that the industrial depression has given way to steady improvement. Moreover, at the moment money is cheap—cheaper than it has been for very many years.

Never was there a more opportune time for the Gas Industry to spend wisely in bringing its manufacturing, storage, and distribution plant into tip-top condition, and in modernizing its domestic equipment to the standard which the public universally demands, and to benefit from low interest charges on capital expenditure and low maintenance cost of running plant. Wise expenditure is a visible manifestation of the confidence which we claim to be the best answer to electrical competition. Sales of electricity owe much to the money spent on raising the efficiency of generating plant. The future sales of gas will depend largely on raising the efficiency of gas-works plant and lowering the cost of gas production.

Standardization

There is a move in the Gas Industry towards a greater measure of standardization, and we think that, with full co-operation between seller, buyer, and user, benefit will ultimately accrue to all concerned. We would emphasize, however, that this benefit—and as far as our Industry is concerned it means better all-round service to the consumer—is only to be gained by whole-hearted co-operation.

Let us for a moment consider very broadly the different viewpoints of the manufacturer of gas-consuming appliances, the gas undertaking, and the user. The manu-

facturer is in competition with other manufacturers in the same field. A large amount of his capital is sunk in special processes—for example, in his particular foundry practice—developed after a great deal of struggle and hard work. He has, by various means, built up a satisfactory demand for his products, on the sale of which he obtains a reasonable profit. The goodwill he he has created towards these products is reflected in the extended use of gas.

The gas undertaking is concerned primarily with the quality of the appliances, secondly with price, and thirdly with the cost of maintaining these appliances in efficient operation. The first essential is that the apparatus offered must have a high factor of safety in use, and it is the duty of the gas undertaking to buy only from makers of appliances which generally conform to a proper standard of safety. Again, in regard to the price at which the consumer can be supplied with gas, this is adversely influenced if the gas undertaking has to carry an enormous stock because of the multiplicity of design in non-essential factors. Moreover, the price is adversely affected if the maintenance costs of appliances are heavy. And with present policy, maintenance costs are assuming more and more importance.

Then the requirements of the consumer must be understood and met, and no one is in a better position to know what these requirements are than the gas undertaking. Its salesmen and its fitters are in constant contact with the consumer. They are in a position to interpret these requirements to those responsible for the running of the gas undertaking, who in turn can interpret them to the manufacturer. The result should be a happy compromise.

That the question of standardization is no easy one will be apparent, and that there will be conflict of opinion is also apparent. But we feel sure that if the matter is approached from all sides in the spirit of co-operation and sweet reasonableness great progress can be made. The complexity of the problem and the methods by which difficulties may be minimized are demonstrated in a paper of the greatest value which Mr. S. F. Dunkley, Officer-in-Charge, Stores Testing, Gas Light and Coke Company, presented to the London and Southern District Junior Gas Association. The first part of this paper on "Standardization and Quality Control" was published in the "JOURNAL" last week, and the remainder will be found on later pages of our issue to-day. It is a closely reasoned contribution by one who has had long experience in standardization, the drafting of specifications, and the testing of materials; and the amount of work already carried out by the Gas Industry in this direction, as outlined by Mr. Dunkley, will probably come as a surprise to many of our readers. The Gas Industry, he points out, was one of the first to be very rigidly standardized from a national point of view as far as the quality, measuring, and method of test of its main products are concerned. The task now is "to bring its appliances up to the same standard."

A Danger to Avoid

WE are exceedingly pleased to note this sentence in the paper: "There is a real danger in standardizing everything and anything simply for the sake of standardization, and in cases where there is no real need of it." And the author goes on to say that the best method is to consider the simple individual thing of which we build the structure and let the whole evolve naturally itself. For example, except so far as safety is concerned, it is often far better to standardize only certain parts of a machine, leaving design and performance open to research and invention. On no account must standardization retard invention or eliminate individuality, and we are certain that this is dominant in the mind of the Gas Industry in seeking the co-operation of manufacturers with the object of mutual advantage. In the long run the manufacturer must benefit from the standardization of certain component parts of apparatus, which, without affecting the individuality of his goods, would reduce his manufacturing costs and relieve the Gas Industry from quite unnecessarily high maintenance charges. It must be admitted that to-day there is enormous waste of time on the district, and inconvenience and delay connected with some of the most simple installation, maintenance, and repair work, delay and return journeys for special tools to fit non-standard parts or to cut special threads, and so on. This can be, and will be, eliminated, and the outcome will be a bigger demand for a quality product at a cheaper price. The consumer's gain will also be the manufacturer's gain.

Standardization necessarily involves the preparation of specifications. In America the American Gas Association is working in the closest connection with the American Standards Association. In this country there is a Gas Industry Committee of the British Standards Institution, and this Committee has set up Technical Committees to investigate the matter from the point of view of establishing methods for the evaluation of efficiencies and methods of test. Apart from gas making and using plant, these Committees are concerned with coal and the bye-products of carbonization, with what may be termed accessories such as flexible metallic tubing, plug and socket gas connections, flue pipes and fittings, and also with a glossary of terms and definitions. The American Gas Association has, of course, gone a great deal further in the matter than we have over here, and has already issued through the American Standards Association a large number of "standards of approval requirements" covering a wide range of gas-burning equipment. The aim in Great Britain also will be to establish minimum performance tests for apparatus, and in all this work we would urge the need for elasticity in the specifications drafted—an elasticity which will not damp down individual effort.

A National Mark

WORKING to specification naturally brings us to the question of the desirability of adopting some national mark for appliances which fall into line with the specifications. There is nothing new in the suggestion, but we would ask once again for its consideration. Makers of repute would experience no difficulty in meeting the requirements, and a national mark would undoubtedly help the smaller buyer. Also the consumer would feel a sense of security in purchasing approved appliances, and the marketing of inferior apparatus would become more difficult. Again, we are moving more and more towards dealer co-operation, and if the dealer co-operates with the gas undertaking in the sale of approved appliances he will enjoy the assurance of satisfied consumers. That this matter is exercising the mind of the electrical industry is evidenced by current discussions on the advisability of establishing some form of "Proving House" for electrical goods.

Any material mark must have as its first step the formulation of agreed specifications. As a corollary there must be testing, and the main responsibility for this, Mr. Dunkley maintains, should rest with the manufacturer. If such were the case, then the working of a central control laboratory should be neither difficult or costly. As we have said, however, the success of any such scheme will depend on co-operation between user, gas undertaking, and manufacturer.

If we turn to standardization of bye-products, there will be general agreement that the manufacture of road tars to the three British Standards Institution specifications has been of the utmost value to the sales of tar for road making. Again the marketing of benzole to the specification of the National Benzole Association has been largely responsible for the popularity of this product and its acceptance by the public. And surely there is need for a national nomenclature for coke sizes. We have referred to this before, but we make no apology for calling attention to the matter once again. Lack of uniformity in the size of material supplied has been a source of many of the complaints which have been made against coke.

Nomenclature for Cokes

As long ago as 1930 we put forward a suggestion for a standard coke nomenclature ("JOURNAL" for Oct. 29, 1930). This differed from the grading standard now in use by the London and Counties Coke Association, our suggestion being based on the opinion that any standard nomenclature should contain a series of sufficiently close gradings so that there would be no desire to sub-divide them further. Our suggestion also made it clear that small coke, provided it is carefully screened, is a thoroughly good fuel for many purposes. But what we want the Gas Industry to do is not necessarily to adopt the nomenclature we put forward, but to adopt some national standard. On Jan. 16 of this year we commented on the excellent move made by the London and Counties Coke Association in deciding to accept gas undertakings in the provinces outside its area as affiliated members of the Association, and we advised gas undertakings to take advantage of the scheme. The Association would then develop into a national organization, and such an organization should consider right away the adoption of a national standard nomenclature for cokes.

Then in regard to gas-making plant, the desirability of arriving at some agreed code as to what should constitute a guarantee test is obvious. One ought to have a better basis than at present of assessing the performance of gas-making plants and of comparing different plants. So much depends on how these guarantee tests are carried out. It would, for instance, clearly be possible to obtain what on paper would appear most excellent results by working a new plant far too fiercely in its early stages, to the detriment of its life. It is questions such as these which should be settled by co-operation between the Gas Industry and the makers of plant; and the Technical Committees of the Gas Industry Committee of the B.S.I. afford an opportunity of carrying this co-operation into practical effect.

Floodlighting for the Jubilee

THERE will be a general feeling of pride and pleasure throughout the Industry as a result of the announcement that gas is to play its part in the floodlighting of various parts of the Metropolis in connection with the celebrations of the Silver Jubilee Year of His Majesty's reign next May. Although it is not yet known precisely what buildings will be illuminated by gas and what by electricity, it is understood that provisional arrangements have been made to floodlight the following public edifices: Buckingham Palace, St. James's Palace, the Admiralty and Horse Guards Arches, the Clock Tower of the Houses of Parliament, the National Gallery, the London County Hall, and Westminster Abbey. In addition, a number of hotels, stores, and other private buildings in the West End of London, together with the flower beds in St. James's Park, are to be similarly treated.

The beautiful results obtained by the floodlighting by gas of the last-named, at the time of the International Illumination Congress, will still be fresh in the memory of many, and it is to be hoped that gas, whose suitability for this kind of illumination is paramount, will once again be utilized for this purpose. Our readers will doubtless recall the photographs of this very fine installation which we reproduced in the "JOURNAL" for Sept. 9, 1931, in regard to which such favourable comment was made at the time.

Mr. Ormsby-Gore's statement last week in the House of Commons that almost the entire cost of this projected floodlighting will be generously borne by the gas and electrical industries was the cause of much gratification in the House—as it will be elsewhere. The British Commercial Gas Association have already circularized their subscribers on the subject with a view to encouraging further local effort in this direction by individual members, and the columns of the "JOURNAL" for quite a number of years now have testified with such regularity to the experience which is available in this branch of activity that no undertaking, however small, need be shy of contributing in this way to the general rejoicings. They will be well advised, however, to formulate their plans early to put before local authorities for the floodlighting of public buildings in their areas.

The Industry as a whole will welcome the opportunity which its proficiency in floodlighting will give it of taking a prominent part in this great national expression of thanksgiving, and we look forward to seeing many fine examples of gas installations throughout the country next May. In the meantime those who are successful in obtaining early approval for schemes will help others who may be meeting with resistance by giving us particulars for publication.

Forthcoming Engagements

February.

7.—MIDLAND JUNIOR ASSOCIATION.—Meeting and paper by Mr. A. Knight.

9.—WESTERN JUNIOR ASSOCIATION. — Meeting at Bridgwater.

9.—SCOTTISH JUNIOR ASSOCIATION (EASTERN DISTRICT). Visit to Leven. Paper by Mr. C. L. W. Berglin.

9.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Meeting and paper by Mr. T. R. Sawers.

11.—I.G.E. General Purposes Committee, 3.15 p.m.

12.—I.G.E. Council Meeting, 10 a.m.

12.—NATIONAL GAS COUNCIL.—Central Executive Board Meeting, 2.30 p.m.

13.—COKE SALESMEN'S CIRCLE.—Meeting at 28, Grosvenor Gardens, 2.30 p.m. Paper by Mr. S. C. Fox, of Tottenham.

14.—B.C.G.A.—Midland District Meeting, Birmingham.

15.—SOUTHERN ASSOCIATION (WESTERN DISTRICT).—Commercial Meeting, Rougemont Hotel, Exeter, 2.30 p.m.

15.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting and paper by Mr. P. F. Scarth.

16.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION. Meeting at Port Talbot. Paper by Mr. West.

16.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Barnsley. Papers by Messrs. V. J. J. Siddons, R. H. McCulloch, and A. Pickard.

20.—B.C.G.A.—Meeting of Executive Committee, 11 a.m.

21.—B.C.G.A.—South Wales District Meeting at Cardiff.

21.—S.B.G.I.—Council Meeting, 2.30 p.m.

Personal

The appointment was announced last week of Mr. EDWARD WILSHAW as Joint Managing Director of Cable & Wireless, Ltd. Mr. Wilshaw is, of course, the Deputy-Chairman of the Romford Gas Company. This appointment follows recent far-reaching managerial changes by Cable & Wireless, Ltd., and their new Joint Managing Director brings with him over forty years' experience in the science of cablework, while he is one of the greatest living authorities on international communications. For more than thirty-five years he was closely associated with the old Eastern Telegraph Company (now merged in Cable & Wireless, Ltd.), and in the later years of that Company he acted as General Manager and Secretary. After the merger he was appointed Chief General Manager and a Director.

Among the many qualifications to his new appointment is his close association with the City. He is a Past President of the Chartered Institute of Secretaries, a Director of many companies within the Cable & Wireless group, a Past Master and a Member of the Court of the Guild of Freemen, a Donation Governor to Christ's Hospital, a Past President of the City of London Branch of the Council of the Royal Society of St. George, and he has recently been elected a Member of the Court of Assistants of the Worshipful Company of Shipwrights.

* * *

Mr. H. JOHNSTON, of the Blackpool Gas Department, has been recommended by the Bradford Corporation Gas Committee for the position of Deputy Gas Engineer.

* * *

Mr. WILLIAM B. MORTON, of the Works Staff of Airdrie Corporation Department, has been appointed Manager of Kilbirnie Gas-Works, Ayrshire.

* * *

Mr. H. SHEWRING, Engineer and Manager of the Rochdale Corporation Gas Department, who is leaving to take up a similar position at Cambridge, was presented with a revolving book table from the staff and employees of the Department at a Smoking Concert held last week. Mr. James B. Stewart (Distribution Superintendent), who handed over the gift, expressed the regret of the employees at losing their Chief.

Obituary

The death is reported from Paris at the age of 89 of M. GABRIEL CHAMON, a well-known member of the French Gas Industry and the founder of the original firm which has since developed into the extensive undertaking known as the Compagnie pour la Fabrication des Compteurs et Materiels des Usines à Gaz, of Montrouge.

Correspondence

Two-Part Tariffs

SIR,—This Company has operated a two-part tariff since Jan. 1, 1930, so that we have had four years' experience of what it is capable of doing in meeting electrical competition and increasing gas sales.

The tariff has proved a big success, as I was confident it would when I recommended my Board to adopt it.

Let no administrator run away with the idea that the introduction of such a tariff would mean a wholesale turning over from the flat rate and a crippling loss of revenue. At any rate, we have had no such experience; nor did I anticipate it. Rather has it been hard work in canvassing and explaining, but it has been well worth while.

Yours, &c.,
H. J. WOODFINE,
Managing Director.

The Wellington (Salop) Gas Company,
Wellington, Shropshire,
Feb. 2, 1935.

State-Aided Research

In the 1933-34 Report of the Advisory Council of the Department of Scientific and Industrial Research it is stated that British industry needs to show in a practical fashion that it is convinced that the application of science to its manifold processes is not merely desirable but is a necessity under modern conditions of world competition. The following is an extract from the Council's Report, which has just been published by H.M. Stationery Office, price 3s. net.:

Last March we had the advantage of exchanging views with leaders in twenty different industries, all possessing co-operative research associations. We desired to obtain the benefit of the collective experience of those responsible for the control of research associations and to enlist their support in the movement to increase the associations' scale of operations. There was ample evidence that those present shared our conviction that the future prosperity of British industry depended largely on the extent to which science was enlisted for its further efficiency. It was agreed on all hands that the research association movement had done and would do much towards this end. Moreover, evidence was forthcoming that the practical sympathy of the Government would encourage further financial support from firms, and all present agreed to go back and think out with their colleagues enlarged programmes and means for their development. Since then we have conferred with ten research associations and discussed with them arrangements for the future which will secure from industry greater financial support and so lead to a greater degree of permanence.

In these discussions we have constantly had in view the inadequacy of the scale of operations of the associations, particularly of the smaller ones, and our proposals have been designed to remedy this. Where circumstances warrant it, we are recommending substantial block grants, which, with the support from industry upon which they will be conditional, will provide at least a satisfactory nucleus of an effective organization. It is the intention moreover that these block grants should be offered for a period of, say, five years in each case, because of the need of the associations for stability of finance. It is impossible to plan intelligently under uncertain conditions of finance, when the short view tends inevitably to prevail over the long, with the result that researches which are vitally important though not immediately productive tend to be crowded out by *ad hoc* inquiry. Research associations, in short, cannot carry out effectively the researches which are required in the interests of industrial progress or make plans for important sections of their programmes of work unless they can offer prospects of reasonable financial security to their scientific staffs; and they can only hope to do this if they can be assured a financial support to enable them to develop their activities over a period of years.

At the same time, we do not think that the scale of operations which will thus be made possible is one with which the industries should rest content. There will still be room for considerable expansion before the associations can be held to be in a position to give fully effective service to the industries they represent; and we propose to encourage such expansion by recommending additional grant on income raised in excess of a specified figure, up to a prescribed limit.

GAS LEGISLATION

A Summary of the Position at the end of 1934

By George Evetts, M.Inst.C.E., M.Inst.Gas E., M.Inst.Cons.E.

The striking articles which Mr. Evetts contributed to the "JOURNAL" at the end of last year are now available in the form of a handy book, in similar style to the very popular annual "Technical Signpost" to the "JOURNAL." A general index and marginal annotations make reference easy, and from the many inquiries received while the articles were running, we believe the publication will find a very general welcome from Boards of Directors, Company Secretaries, Municipal Officers, and in many other quarters.

From the "JOURNAL" Office—
pp. 51, bound in cloth, 3s. 6d. net, postage 3d.
Six copies and over, post free.

Gas Light and Coke Company Accounts

The Gas Light and Coke Company has had a successful year. In spite of the mild weather in December and the increased number of modern appliances in place of older and more extravagant models the sale of gas shows an increase for the first time since 1931.

The increase in sales is 1,058,977 therms or 0·43% against a decrease of 1·78% in 1933, and although the percentage is small the actual quantity would be sufficient for a town of about 15,000 inhabitants. Private consumers have taken almost the same amount; public lighting, contracts, and processes together account for the increase.

The Report of the Directors shows that the Company's consumers have increased by 31,024 and the number of stoves sold and let out on hire has increased by 128,283.

The profit for the year is £2,026,116 against £1,977,765, and after paying the proposed dividend of £5 12s.% (the same as for several years past) the carry-forward is only reduced by £3,061 to £183,068.

Capital account shows expenditure during 1934 to have been £659,726, made up of land £4,230, plant £25,867, mains and service pipes £296,167, meters £150,572, stoves £182,890. £247,247 was written off by way of depreciation, leaving a net addition of £412,479 against a net addition for 1933 of £377,848. Total expended to date, less amount redeemed, amounts to £25,324,338 or 2s. 0·3d. per therm sold.

No capital has been raised during 1934, but £29,282 ordinary stock was redeemed. The balance overspent was £995,953 at Dec. 31, but during the past fortnight a successful issue of 3% debenture stock at 93½% has been made. The nominal amount is £2,500,000, which should realize £2,337,500 at the price of issue.

The principal items of receipts and expenditure in the revenue accounts for the past two years are set out below.

Receipts.

—	1934.	1933.
	£	£
Gas (*less* public lighting expenses)	8,213,239	8,302,315
Rentals	1,592,336	1,587,420
Rents and transfer fees	51,953	49,062
	£9,857,528	£9 938,797

Expenditure.

—	1934.	1933.
	£	£
Coals, oil, &c. (*less* residuals)	1,297,138	1,415,703
Wages (carbonizing)	326,238	342,094
Salaries of engineers, &c.	151,248	150,004
Purification	57,279	67,179
Repair and maintenance of works and plant	944 527	1,103,711
Total net manufacture	2,776,430	3,078,691
Distribution	3,378,294	3,235,486
Co-partnership	110,206	107,627
Rents, rates, and taxes	769,451	730,156
Management	463,425	473,957
Miscellaneous, including annuities and contributions to superannuation funds (£217,371)	333,606	335,115
Total expenditure (*less* residuals)	£7,831,412	£7,961,032
Balance to net revenue account	2,026,116	1,977,765
Dividend and interest (net)	2,029,177*	2,007,186*
Balance being deficit	£3,061	£29,421

* Includes £40,000 to redemption fund.

Receipts from gas are £89,076 less in spite of the increased quantity sold, indicating that a loss on domestic consumption has been made up by lower priced trade and process supplies, and the statement of gas sold confirms this.

Rentals have increased by nearly £5,000 as a result of increased revenue from hired appliances and prepayment fittings. Meter rents are slightly less. Total receipts are £81,269 less.

Coal cost £147,214 more at £2,986,612. The quantity carbonized was 3,011,227 tons at 19s. 10·38d. per ton, against 2,810,692 tons at 20s. 2·45d. Oil cost £40,085 less at £155,208 for 11,893,819 gallons at 3·132d. per gallon, against £195,293 for 18,203,316 gallons at 2·575d. The increased cost per gallon is due to the tax on oil having its full effect in 1934. Coke cost less by £29,406 and gas in bulk £376 more. Thus coal, coke, oil, and gas in bulk cost £78,099 more. Residuals realized £196,664 more due to better prices and larger quantity due to the increased amount of coal carbonized. Coke was better by £171,417, breeze by £11,939, tar (including benzole) by £12,896, and ammonia by £412. Net coals thus cost £118,565 less. The increase in coal is due to less water gas being made. The improved prices of residuals and the tax on oil no doubt caused this alteration in manufacturing methods to be adopted.

Net coal cost per therm sold was 1·24d. in 1934, against 1·36d. for 1933.

Economies have been effected in wages and purifying costs, and repairs and maintenance of works is less by £159,184, so that cost into gasholder was less by £302,261 at £2,776,430, or 2·66d. per therm sold, against 2·96d. per therm sold. Distribution has cost £142,808 more, owing to salaries and wages £15,562 more, repair and maintenance of mains and services £98,244 more, repair and renewal of meters £13,900 more, stoves £47,110 less, and automatic meter supplies £26,212 more. Co-partnership is slightly more, rents, rates, and taxes are up, chiefly due to an increase of £37,475 in rates and taxes, management and miscellaneous charges are both a little less, so that total costs less residuals are £129,620 less, and with the reduction in receipts referred to above of £81,269 the profit to net revenue account is £48,351 more. Interest on debenture stocks, temporary loans, and sundry funds (*less* credits) needs £636,718. Interim dividends at the maximum rates on preference and maximum dividend stocks and at £5 12s.% per annum on the ordinary stock needed £676,639, and the final dividends will need, at the same rates, £675,820, leaving, after contributing £40,000 to redemption fund, a balance forward to 1935 of £183,068 against £186,129 brought in.

All the funds have been credited with the appropriate interest for the year and the balance-sheet shows cash £194,485, investments in allied undertakings £400,128, and sundry debtors £3,977,384. A temporary loan from the bank is £725,000, and sundry creditors and credit balances amount to £2,300,458.

Following are figures from the statements of gas made, sold, &c.:

—	1934.	1933.
	Therms.	Therms.
Quantity made and bought	264,548,809	263,440,470
Quantity sold —		
Private consumers	229,244.526	229,273,336
Public lighting and contracts	4,904,404	4,662,607
Sundry processes	9,668.333	7,489,200
Correction for temperature and pressure	6,550,948	7,884.091
	250,368,211	249,309,234
Quantity used on works	2,626,254	2,762,475
Quantity accounted for	252,994 465	252,071,709
Quantity not accounted for	11,554.344	11,368,761
	4·37%	4·32%

It will be seen that a very slight decrease in private consumption has been offset by a substantial increase in gas for public lighting, contracts, and for sundry processes, which presumably include benzole manufacture.

Unaccounted-for gas is practically unchanged and remains a satisfactory figure.

The following results show the efficiency of the Company's working to have been even higher than for 1933:

	1934.		1933.
Coal cost per ton	19s. 10·38d.	..	20s 2·45d.
Therms made per ton of coal carbonized	76·02	..	75·65
Coke made for sale per ton of coal carbonized (cwt.)	9·92	..	9·77
Tar made per ton of coal carbonized (galls.)	10·39	..	10·66
	s. d.		s. d.
Prices realized—			
Coke per ton	19 5·21	..	18 8·00
Breeze per ton	4 8·09	..	3 11·33
Tar per gall.	0 3·45	..	0 3·50
Liquor per butt	0 0·83	..	0 0·61
	Per Therm Sold. d.		Per Therm Sold. d.
Expenditure (*less* residuals)	7·51	..	7·66
Gas, rentals, &c.	9·45	..	9·56
Balance, being profit	1·94	..	1·90
Dividend and interest	1·94	..	1·93
Deficit	0·00	..	0·03

South Metropolitan Gas Company Accounts

Although 4,028 additional consumers have been connected to the South Metropolitan Gas Company's mains in 1934, the Report of the Directors discloses a decrease in gas consumption in the Company's area of supply of 2·31%.

The sale in bulk to the South Suburban Gas Company has fallen from 1,942,618 therms to 1,438,921 therms.

The decrease in consumption per consumer revealed by an increase of nearly 1% in the number of consumers, together with a decrease in the sale of gas, is accounted for by changes in social conditions, the extension of small flats, and a very mild December. Another reason for this decrease may be inferred from the fact that hire-purchase contracts for appliances have increased by three-fourths, and most of these new appliances must have replaced older and less efficient apparatus.

There has been an appreciable increase in gas sold for public lighting, probably owing to the improved standard of illumination now demanded by the public. The report states that a new type of directional lamp, now being demonstrated in Lewisham and Deptford, enables an unequalled means of lighting to be provided.

The decrease in revenue from gas has only partly been met by a decrease in expenditure, and the proposed dividend is 5¾% on the ordinary stock against 6% paid for three years past.

The capital account shows expenditure during 1934 on buildings, plant and machinery £24,349 (against £22,873 in 1933), mains £27,115 (against £9,640), meters £10,032 (against £4,763), and stoves and fires £3,138 (against £10,514), making a total of £64,634 (against £47,790). No capital has been raised during the year and the balance unspent is now £302,280.

The Bills sanctioned by the proprietors last year have become law, one to prohibit housing authorities from making regulations to limit the use of gas, the other to permit consumers by prepayment meters to pay separately for gas and appliances.

The following is a summary of the main items appearing in the revenue account:

Receipts.

—	1934.	1933.
	£	£
Gas (*less* public lighting expenses)	2,799,810	2,890,363
Rentals	424,179	427,531
Rents and transfer fees	6,075	6,486
	£3,230,064	£3,324,380

Expenditure.

—	1934.	1933.
	£	£
Coal (*less* residuals)	389,329	464,986
Wages (carbonizing)	187,592	192,383
Purification	54,038	54,439
Salaries of engineers, &c.	82,202	81,778
Repairs and maintenance of works and plant	482,614	509,105
Total net manufacture	£1,195,775	£1,302,691
Distribution	945,200	889,341
Co-partnership	50,324	67,099
Rent, rates, and taxes	128,907	134,997
Management	179,810	175,082
Miscellaneous, including superannuation fund (£72,291), Co-partnership insurance fund (£84,691)	184,052	194,534
Total expenditure (*less* residuals)	£2,634,068	£2,763,744
Balance to net revenue	545,996	560,636
Dividend and interest (net)	545,910	561,143
Leaving	£ 86*	£ 507†

* Surplus. † Deficit.

The receipts are down as to gas by £90,553, partly on account of the reduced sale, and as to rentals by £3,352 which may be accounted for by the replacement of hired apparatus by the consumer's own property and perhaps by a reduction in the prepayment consumption.

Net expenditure was reduced by £79,676. A saving of £41,507 in coal was due chiefly to a reduction of 34,174 tons in the quantity carbonized to 1,118,573 tons. Bye-products receipts were £34,151 more at £693,701. The improvement in receipts from residuals was due to an improved price per ton of coke, 512,157 tons realizing £520,134 or 20s. 3·74d. per ton against 544,929 tons in 1933 realizing £509,721 (18s. 8·49d. per ton).

The reduction in coke made for sale is due to the reduced quantity of coal carbonized and a slightly lower make per ton of coal. The improved price is a reflection of improved market conditions and possibly of the progress in sales of "Metro Coalite."

Tar has improved from £140,941 to £153,724 and ammonia from a loss of £836 in 1933 and of £8,111 in 1932 to a profit of £11,680.

Net coals have thus improved by £75,657 and there has been a saving of £26,491 in repairs and maintenance of works and of £4,791 in wages. The cost into gasholder per therm sold is reduced as a consequence from 3·65d. in 1933 to 3·42d. in 1934.

Every item under "Distribution" has increased except repair and renewal of meters. Salaries are £3,727 more, meters £7,901 less, stoves and fires £41,432 more, and fittings £1,767 more, or £55,859 more in all. The report states that changes in public demand entail heavier and expensive calls on the distribution side of the Company's business and the expenditure is not immediately remunerative. The cost of distribution is a function of the numbers of consumers and appliances rather than of therms sold.

Co-partnership is less by £16,775 at £50,324 due to the reduction in dividend. Under the basic price system applied to this Company for every sum the shareholders receive in excess of 5% dividend, the co-partners receive a like sum by way of bonus. A reduction of dividend from 6% to 5¾% reduces the sum available for bonus by 25%.

Rents, rates, and taxes are a little less and management a little more. Miscellaneous expenses are less by £10,482 at £184,052, the most notable reduction being superannuation at £72,291 against £85,692. The report states that the Superannuation Funds are being examined by the Company's Consulting Accountants in the light of present-day circumstances.

Balance to net revenue is less at £545,996 against £560,636, but owing to the reduced demand for ordinary dividend referred to earlier a deficit of £507 becomes a surplus of £86, taking into account interest received and dividends on South Suburban and Commercial Gas stock, which is held by the Company as a result of the exchange of shares with the shareholders of those companies.

Summing-up, a reduced revenue from gas and an increased expenditure on distribution have been met by increased revenue from bye-products, economies in gas manufacture, and the sacrifice of £16,775 each by co-partners and shareholders. Full interest has been credited to all the funds.

The balance-sheet shows cash £114,341 and investments £384,831. Sundry creditors are £287,908, but accounts due to the Company amount to £607,017 and in addition £169,157 is outstanding on hire-purchase account.

In accordance with the Company's Act of 1925 a Bill is being promoted in Parliament in the present session and will be submitted to the proprietors for approval. It gives local authorities an opportunity to ask for revision of the basic price and makes sundry other provisions including an adjustment of the area of supply.

Following is the statement of gas made, sold, &c.:

—	1934.	1933.
	Therms.	Therms.
Quantity made and bought	84,191,674	87,167,746
Quantity charged	80,704,587	82,905,033
Correction for temperature and pressure	2,544,578	2,781,543
Total sold	83,249,165	85,686,576
Used on works	1,489,326	1,417,460
Quantity accounted for	84,738,491	87,104,036
Quantity not accounted for	546,817 (0·64%)	63,710 (0·07%)

It should perhaps be mentioned that the unaccounted-for figure although higher than in 1933 is in the other direction

—*i.e.*, more gas is accounted for as sold and used than has been made and purchased. There seems no further room for improvement in this figure!

The following principal working results and costs per therm show that previous excellent figures are well maintained:

	1934.		1933.
Coal cost per ton	19s. 4·00d.	..	19s. 6·13d.
Therms made per ton of coal carbonized	75·16	..	75·71
Coke made for sale per ton of coal carbonized, cwt.	9·16	..	9·45
Tar made per ton of coal carbonized, gallons	10·65	..	10·46

	1934. s. d.		1933. s. d.
Prices realized—			
Coke per ton	20 3·74	..	18 8·49
Tar per gallon	0 3·10	..	0 2·79
Liquor per butt	0 6·32	..	0 0·58*

* Deficit.

	Per Therm Sold. d.		Per Therm Sold. d.
Expenditure (*less* residuals)	7·74	..	7·74
Gas rentals, &c.	9·31	..	9·31
Balance, being profit	1·57	..	1·57
Dividend and interest	1·57	..	1·57
Balance	..	..	..

News in Brief

For the Fourth Time in a week the Filey electricity supply failed in the early afternoon of Feb. 1.

Work is Approaching Completion on the construction of a new Gas-Works at Lugano, the well-known Swiss holiday resort in the Canton of Ticino.

Some Trials of the use of compressed town gas for the running of the engines of motor 'buses, it is reported, have lately been made in Johannesburg, South Africa.

An Engineer and Manager is required by the Altrincham Gas Company at a commencing salary of £800 per annum. Applicants should not have exceeded the age of 45 years.

The Extension of Existing Limits for the supply of gas is among the provisions of a Special Order for which the Smethwick Gas Department intend to apply to the Board of Trade.

A New Gasholder is to be erected to replace that adjacent to the offices of the Chesterfield Corporation Gas Department. The cost is estimated at £3,500 and will be met out of the reserve fund.

Application is Intended to be made to the Board of Trade by the Newcastle-under-Lyme R.D.C. for a Special Order under the Gas Undertakings Acts, 1920 to 1934, to amend the Audley Gas Order, 1925.

The Mynyddislwyn Gas Department give notice that as and from May 6 next they intend to supply gas at a calorific value of 425 B.Th.U. in substitution for gas of 460 B.Th.U. as at present being supplied.

Gas-Fired Central Heating has been installed in the recently opened Infants' School at Monkmoor by the Shrewsbury Gas Light Company, Ltd. The system is thermostatically controlled; the school provides for over seventy children.

Tenders for the Purchase of their Gas-Works, as a going concern, are invited by the Bethesda Urban District Council. The Council are the statutory undertakers in the area, and full particulars may be obtained from the Gas Engineer and Manager.

An Interim Dividend at the rate of 6s. 6d. per share, payable on Feb. 14, has been declared by the Directors of the Metropolitan Gas Company of Melbourne. We have received this information from the Company's London Agents, Messrs. John Terry's, of Regent Street, Ltd.

Cookery Demonstrations.—Three gas cookery demonstrations forming part of a series being given in Shrewsbury and district by the Shrewsbury Gas Light Company were held recently in St. George's Hall. Miss D. E. Simpson was the lecturer, and the hall was well filled each afternoon. Heating, cooking, and hot water supply apparatus were also shown.

Sales of Gas Cookers on Hire Purchase terms during 1934 reached slightly over 3,000 in the area of supply of the Lincoln Gas Department. As the new terms of hire purchase of 6d. per week did not come into operation until Easter, it is anticipated that the sales for the financial twelve months ending next March will be considerably in excess of this figure.

Application is to be Made to the Board of Trade by the Commercial Gas Company for a Special Order to authorize the Company to borrow on mortgage of their Undertaking or by the creation and issue of debenture stock any amount not exceeding 70% of the aggregate amount of the paid-up share capital of the Undertaking for the time being and of any premiums in respect thereof.

Gas Production at French Collieries.—Rapid progress continues to be made with the production of gas at the collieries in Northern France. At the works connected with the Anzin mines, one of the largest undertakings in the area, the sales of gas during last year reached a total of 1,835,120,400 c.ft. compared with 1,591,209,900 c.ft. in 1933, an increase of over 15%.

Wandsworth Company's Dividend.—The Directors of the Wandsworth and District Gas Company are recommending a dividend of 3½% on the consolidated stock for the six months ended Dec. 31, 1934. This makes, with the interim dividend, a total for the year of 7%, which has been maintained since the consolidation of stocks in 1930. A record number of appliances has been sold during the year.

Gas for Vitreous Enamelling formed the subject of a recent issue of the B.C.G.A.'s "A Thousand-and-One Uses for Gas," when many of the processes in this important and growing industry were described and illustrated. Included in this review were references to the activities and a photograph of a gas-heated drying oven at a well-known firm of enamellers whose works we described in our issue for April 18 last.

Dividends are Recommended by the Directors of the East Surrey Gas Company on the preference and ordinary stock for the half-year ended Dec. 31 last at the following rates per annum: 6% on the cumulative preference; 4½% on the redeemable preference; 5½% on the preference "A;" and 6% on the ordinary "B," all less income-tax. These dividends are at the same rates as those paid for the half-year to June 30 last.

The Weymouth Consumers Gas Company announce that from the last quarterly reading of meters the following increased discounts will come into operation: From 25,000 to 50,000 c.ft. per quarter, 5% discount; 50,000 to 100,000 c.ft. per quarter, 10%; 100,000 to 200,000 c.ft. per quarter, 12½%; 200,000 to 300,000 c.ft. per quarter, 15%; and 300,000 to 500,000 c.ft. per quarter, 17½%. Over 500,000 c.ft. per quarter and gas used for power special rates will be quoted giving up to 25% discount. During the past two years the reduction in the price of gas and increased discounts have benefited gas consumers to the extent of over £7,000 per year.

1935 "JOURNAL" DIRECTORY

Various announcements and Official Changes affecting the 1935 "JOURNAL" Directory were given in our issue for Jan. 9 last. In order that our readers may keep their list of personnel of gas undertakings, &c., right up-to-date, it is proposed to publish such alterations as are brought to our notice in the first issue of each month.

Page 8. BISHOP'S STORTFORD. Name changed to Bishop's Stortford, Epping, and District Gas Company.

Page 48. NEWMARKET. H. H. Redwood appointed E., M., & S. vice J. H. Troughton retired.

Page 54. PRESTON. S. Tagg, E. & M., elected a Director.

Page 58. ST. NEOTS. W. Bolton appointed E. & M.

Page 68. TORPOINT. E. Watty appointed E. vice T. M. Haley resigned.

Page 92. STRANRAER. T. M. Hunter, S., deceased.

A Highly Successful Exhibition of modern cookers, gas fires, geysers, and washing machines was held in the Municipal Hall, Colne, during the fortnight ended Feb. 1, by the Colne Gas Department. Cookery demonstrations were given twice daily by Miss E. Eccles, C.D.S. These were very largely attended, the estimated number present being in the neighbourhood of 5,000, while many hundreds were turned away owing to lack of accommodation.

Blackpool Sports Club.—At the annual meeting of the Blackpool Gas Department Sports Club the following officials were re-elected: Mr. T. R. Cook, Engineer and Manager, President; Mr. T. V. Blake, Assistant, Vice-President; Mr. A. Bowers, Treasurer; Mr. A. Butterworth, Secretary; Mr. R. C. Crompton, Assistant Secretary; Mr. H. Johnston and Mr. T. J. McAuliffe, Auditors; and Messrs. John Potter and Harrison, Official Auditors.

Folkestone Mainlaying Scheme.—The Folkestone Gas Company have recently launched a mainlaying scheme which will cost about £11,000. The Company's business continues to expand and the increases in the early part of last year necessitate the enlargement of the distribution system. Messrs. William Press & Son have undertaken the work, which includes fourteen roads at Folkestone and thirteen at Hythe. The work will be finished before next summer.

The Annual Dinner and Social of the Shrewsbury Gas Light Company, Ltd., was held on Jan. 30. Mr. C. M. D. Belton, Engineer, Manager, and Secretary, presided, and he was accompanied by Mrs. Belton. The guests included the Mayor of Shrewsbury, Mrs. M. W. Cock, Mr. R. D. Bromley, Chairman of the Company, Mr. W. Adams, Vice-Chairman, Messrs. Alfred Mansell, R. Williams, W. O. Wilding, and H. L. Grocott, Directors, and Mr. C. S. Asbury, Auditor.

More Economic Working was the chief consideration of the Liverpool Gas Company when they recently decided to close down their Eccles Street Works at the end of April. These were the oldest branch Works of the Company, being over a century old and much of the plant was considered to be out-of-date. The Company hope that the majority of the 120 employees at Eccles Street will be absorbed at the quite modern Garston Works, which are being extended to meet the increased demand.

Our Readers will be Interested to see in the last issue of "A Thousand-and-One Uses for Gas" further details and illustrations of the gas installation at Sassoon House, Peckham, which we described in our issue for Dec. 5 last. In addition to gas lighting throughout, each flat is equipped with coke fire, wash copper, and multi-point water heater, these appliances being vented to the roof of the building by means of "Everite" flue equipment. Other examples of all-gas flats are also described in this B.C.G.A. publication.

Believing that Good Food is as essential as anything else in the enjoyment of a holiday, the Colwyn Bay Hotel and Apartment Housekeepers' Association, co-operating with the Municipal Gas Department, recently formed a scheme under which free demonstrations by expert accomplished cooks will be given at the end of the month to the Association's 500 members. During the recent Health Exhibition, the Gas Department sponsored cookery demonstrations at the Pier Café. Over 2,500 ladies attended the demonstrations during the 3 days.

Bilston Share Auction.—By instructions of the Directors of Bilston Gas Light and Coke Company Messrs. Thomas J. Barnett & Sons submitted for sale by auction at Wolverhampton a portion of the unissued "B" shares of £5 each in that Company. The sliding scale dividend on these shares is 7%, but for the past 35 years, with the exception of three years, a regular dividend of 8% has been paid. The shares were offered in lots of twenty each representing a nominal amount of £100. A large company was present, and bidding was keen. The first lot made £187. In all forty-three lots of twenty shares each were sold. The lowest price was £176. The sale realized £7,670, being an average of just over £178 a lot.

Bulk Supply for Ampthill.—The Ampthill (Bedfordshire) Gas and Coke Company is to cease gas manufacture and receive a bulk supply from Luton. In supplying Ampthill the Luton Gas Company who bought the Ampthill Company last year will supply several other parishes *en route*. These provisions are embodied in a special Order for which the Luton Company decided to make application to the Board of Trade at a recent extraordinary general meeting of the proprietors. The Company also wished to take powers to raise a further £24,000 of Consolidated Stock "A," and some £14,000 of loan capital. The figures for the year showed an increase in the sales of gas of 6·9% on the year before, or an increase of over 55 million c.ft.

Through the Generosity of Mr. A. J. Harrison, Engineer and Manager of the Accrington District Gas Board, 115 men attending the Great Harwood Occupational Centre of the Social Service Council were provided with a dinner and social. Mr. Harrison, who bore the cost, visited the centre and was welcomed by Mr. H. Hallworth, the organizer. He said he was pleased he could associate himself with the unemployed, and he hoped before long the wheels of industry would be turning again, so that they could resume their normal occupations.

Gas-Works Closed Down.—The Billingborough and Horbling (South Lincolnshire) Gas-Works have now closed down. The Company was established in 1864 with a capital of £2,000, divided into 200 fully-paid shares of £10 each. After 50 years of success, during which period big dividends were paid and the shares reached a substantial premium, the Company went into voluntary liquidation in 1920, a first and final dividend of £1 per share being returned to the shareholders. The Works were then sold as a going concern to a syndicate which carried on for some years and later were disposed of to a private individual. Many residents of the district, particularly the users of gas cookers, deplore the suspension of the service.

The Eleventh Annual Dinner and Co-partnership Gathering for the employees of Broadstairs Gas Company was held at the Grand Hotel, Broadstairs, on Saturday, Feb. 2. Forty-four co-partners and their wives attended. The gathering was the first held since the Company was taken over by the South-Eastern Gas Corporation in January, 1934. Mr. Henry Woodall, a Director of the Company, presided, and was supported by the Chairman of the Urban District Council (Councillor B. J. Pearson) and others. Mr. Woodall paid tribute to the late Chairman of the Broadstairs Company, Mr. E. L. Burton, who inaugurated the Co-partnership Scheme. "The Visitors" was proposed by the Chairman and responded to by Dr. A. M. Watts.

"Mechanical World" Electrical Year Book, 1935

We are indebted to Messrs. Emmott & Co., Ltd., 28 Bedford Street, Strand, W.C. 2, for forwarding us a copy of the "Mechanical World" Electrical Year Book. In this edition a new section appears which treats the subject of rectifiers thoroughly and gives absolutely up-to-date information. The general information for electricity users and electrical engineers which has made the book so popular for many years has, of course, been extensively revised. The price of the publication is 1s. 6d. net.

In the Cause of Health

Work of the Manchester Committee on Cancer

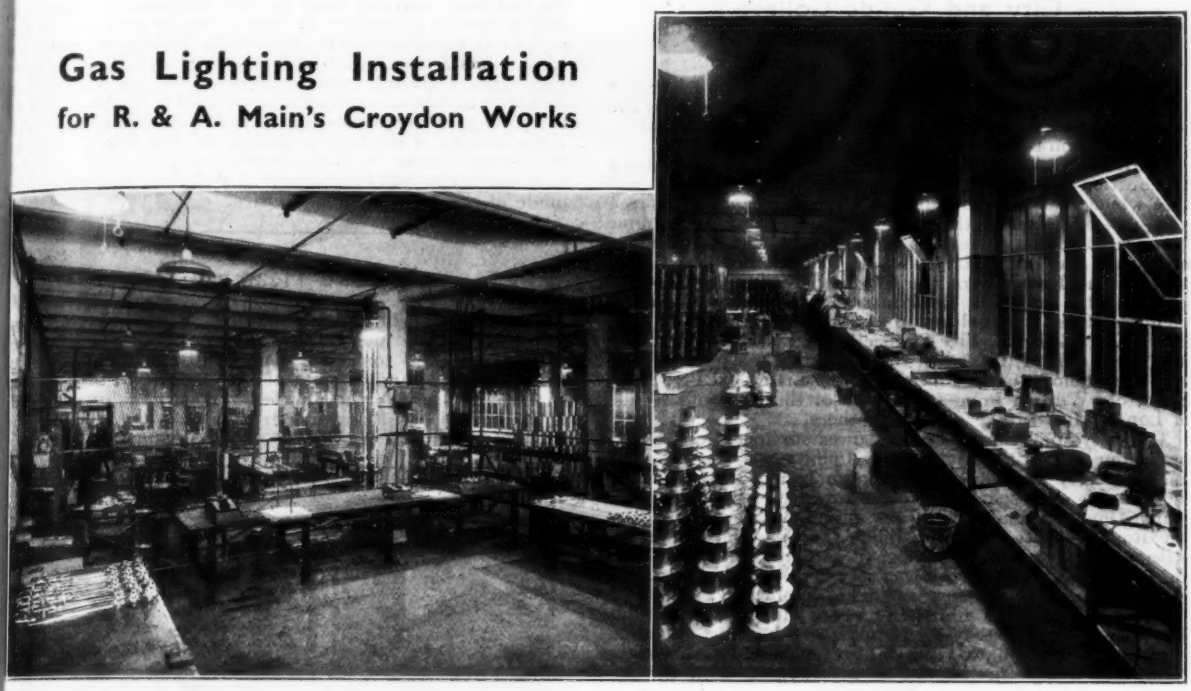
It gives us great pleasure to be able to bring to our readers' notice an appeal by the Manchester Committee on Cancer—a cause that will be of interest to many within our Industry. This Committee (whose Headquarters are at Sunlight House, Quay Street, Manchester, 3) was formed in 1925 as a result of the issue of the first of the Memoranda on cancer published by the Ministry of Health, on steps which should be taken to improve the methods of treatment and control of this disease. Their present appeal is for funds to enable the Committee to continue its research work into industrial cancer, especially as it occurs in the gas and tar industries.

Figures which have been taken from the Home Office Returns, show that during the year 1933, of 16 notifications among gas workers there were 9 deaths, or 56·2%; of 38 notifications in the tar distillery industry there were two deaths, or 5·1%; of 32 notifications in the patent fuel industry there was one death, or 3·1%. Protection against cancer in the gas and tar industries is more difficult than in the case of mineral oil industries owing to the complexity of gas tars.

The Manchester Corporation have recognized the importance of the work to their employees, and it is to be hoped that other cities, boroughs, and urban districts will follow this lead in making some contribution towards the cost of continuing the Committee's investigations in a matter of vital importance to the workpeople in these industries. Donations should be sent to the Hon. Treasurer of the Committee at the address already mentioned.

Gas Lighting Installation

for R. & A. Main's Croydon Works



Messrs. R. & A. Main, of Edmonton and Falkirk, recently placed an order with the Croydon Gas Company to light their water heating department at Omnia Works, Thornton Road, Croydon. The installation was planned by the Gas Company's staff, and suitable lamps supplied by Messrs. W. Sugg & Co.

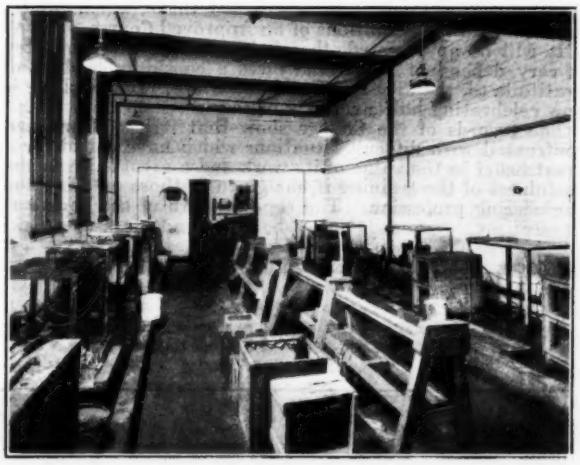
The general lighting of the assembly shop is carried out by 23 4-light "Worklite" lamps mounted at 11 ft., each lamp being fitted in the centre of a 400 sq. ft. area. This arrangement resulted in a maximum illumination of 7·5 foot candles at floor level being given with a minimum of 2·5 foot candles. For the bench lighting in the shop, 15 3-light lamps with special deep reflectors were employed, fitted 5 ft. above bench level and 10 ft. apart, and with the general lamps in use photometric readings reveal a maximum illumination on the bench of 18·5 foot candles, with a minimum of 12 foot candles. In the testing section of the assembly shop a 4-light "Worklite" lamp was fitted 7 ft. 6 in. above the level of each of four benches, giving a maximum illumination of 12·5 foot candles and a minimum of 6.

Similar lamps were fixed in the polishing and tinning shops, and it is interesting to note that in these cases, as in the case of the testing section already referred to, in order to obviate mantle reflection in the work being handled, special screens were fitted to the lamps.

The two stores section of the factory were equipped with 4-light "Surbiton" lamps with parabolic reflectors, 11 ft. above floor level. These lamps were so arranged that two per bay, one fixed at either end facing the centre, gave a mid-point illumination of 18 ft. candles, which resulted in the most minute detail of fittings in stock being readily discerned.

The total installation consists of 72 lamps having a rated hourly consumption of 685 c.ft., the supplies to the lamps being governed by two constant pressure governors.

The accompanying photographs show the effective lighting of various sections of the works.



Institution of Gas Engineers

Members of the Institution of Gas Engineers are invited to attend the Meeting of the London and District Section of the Institution of the Rubber Industry, at the British Empire Club, 12, St. James' Square, London, S.W. 1, on Monday, Feb. 11, 1935, at 7.30 p.m., when a Paper on "Rubber in the Gas Industry" will be read by Mr. C. R. Austen.

Gas for Tomato Growing

Clyde Valley Gas Supply Company's Progress

Further progress of the Clyde Valley Gas Supply Company's scheme to assist the tomato-growing industry in Lanarkshire by supplying them with gas at 2d. to 2½d. a therm is reported from Scotland. All the preliminary arrangements, it is reported, have now been successfully negotiated, and we learn that the Company proposes to embark almost immediately on work involving an expenditure of £80,000 and giving employment to over 400 men for several months.

References to the scheme have been made in the "JOURNAL" from time to time. On Aug. 9, 1933, we recorded that the Company had applied to the Board of Trade "for permission to erect plant for the production of gas for the use of tomato growers in Lanarkshire." In September of the same year we were able to give the information that the Company was to be sponsored by MacLaurin Coal Products, Ltd., of Glasgow, and that MacLaurin carbonization plant would be installed and smokeless fuel produced. At that time the Company intended applying "for powers to supply gas generally in areas not supplied by the Lanarkshire County Council."

On April 4 of last year we reported that the "Principals and Officials of the Clyde Valley Gas Supply Company, Ltd., paid a visit to the Arbroath Gas-Works where they saw much that interested them, and views were exchanged on the use of gas for glasshouse heating systems."

City and Guilds College

Jubilee Celebrations

The Education side of the Gas Industry owes much to the City and Guilds of London Institute, whose assistance in the training and examining of aspirants to high positions in the profession is well known.

Much interest will therefore be attached to the Jubilee Celebration of the City and Guilds College, South Kensington, which took place on Monday in the presence of a large and distinguished gathering—including Lord Linlithgow (Chairman of the Governing Body of the Imperial College of Science and Technology) and Mr. W. T. Prideaux (Chairman of the Delegacy of the City and Guilds College), together with Prof. H. E. Armstrong, the only surviving member of the original group of professors at the College; Prof. L. N. G. Filon, Vice-Chancellor of London University; Mr. H. T. Tizard, Rector of the Imperial College of Science and Technology; Sir Philip Cunliffe-Lister, M.P.; Lord Snell, Sir William Pope (Chairman of the City and Guilds of London Institute), and many others.

The City and Guilds College owes its inception, as its name implies, to the City Livery Companies. In the year 1878 the City and Guilds of London Institute for the Advancement of Technical Education was established, at which time examinations in gas manufacture were held by the Royal Society of Arts. When the City and Guilds Institute took over the technological examination in 1879 the subject of gas manufacture was retained. The first entrance examination to the College was held in February, 1885.

For a considerable number of years the City and Guilds Institute have assisted the Industry by holding approved courses and examinations in Gas Subjects. In earlier days there was a certain amount of overlapping with the Institution of Gas Engineers Examinations, which, however, was eliminated in 1925 by the establishment of Minor Group Courses in Gas-Works and Gas Supply Practice and making Gasfitting definitely a craftsman's course. These Minor Courses are intended, of course, for those who are not desirous of taking the Major Courses in Gas Engineering and Gas Supply. The City and Guilds of London Institute conducts the Final Examination and awards the Certificates, which, in the case of Internal Candidates, are endorsed by the Institution of Gas Engineers, provided the Gas Education Committee is satisfied that the candidates have fulfilled the conditions of an Approved Course.

It will be appreciated, therefore, that the Gas Industry is very dependent upon, and owes a considerable debt of gratitude to, the City and Guilds Institute, whose College is now celebrating half-a-century of service.

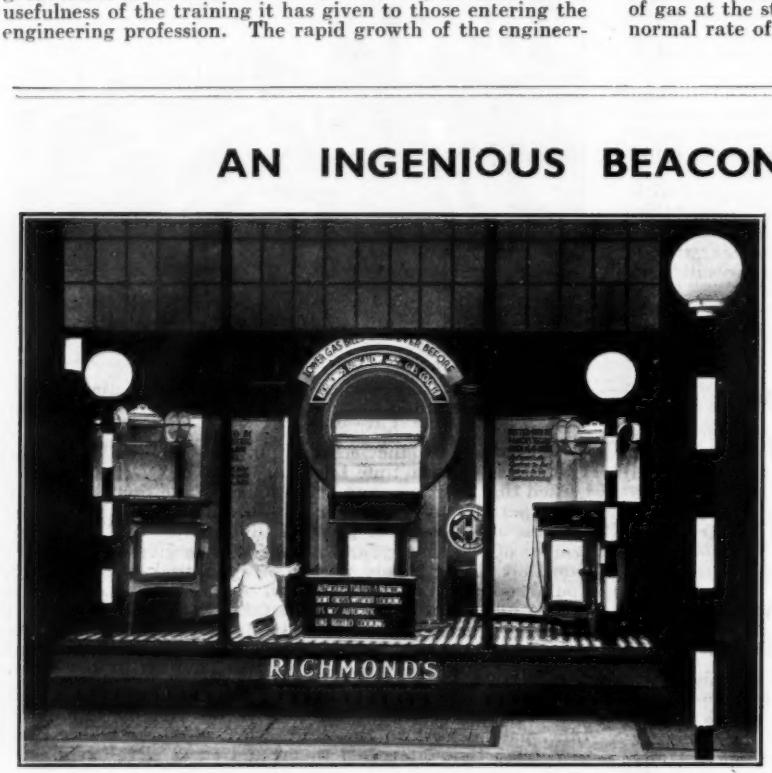
The records of the College show that it has often been confronted with difficult situations which have called for a great belief in the value of its work and a great faith in the usefulness of the training it has given to those entering the engineering profession. The rapid growth of the engineering industry, and not least the Gas Engineering side of it, multiplies the difficulties in that a similar extension of the system of training is demanded if the College is to fulfil its function as a training ground for every branch of engineering. But although this expansion of the engineering industry brings increase of responsibility, it also brings to the College a corresponding increase of opportunity; and if the history of the College during the last fifty years is to be trusted, there is little doubt but that these greater responsibilities will be shouldered and that the best will be made of the greater opportunities.

A Coke Heap on Fire

The coke stock at the Elswick station of the Newcastle-upon-Tyne and Gateshead Gas Company, involving several thousand tons, was found to be on fire on Friday night, Jan. 25, and in spite of every effort to get down to the seat of the fire the affected zone gradually extended, being fanned by strong westerly gales. The whole of the

coke untouched by the fire was removed by working day and night and all danger to the adjoining property was eliminated. Assistance was given by the City Fire Brigade, and a number of unemployed men with hired wagons were taken on to assist the Company's staff. The manufacture of gas at the station was not affected and proceeded at the normal rate of about 4½ million c.ft. per day.

AN INGENIOUS BEACON LINK-UP

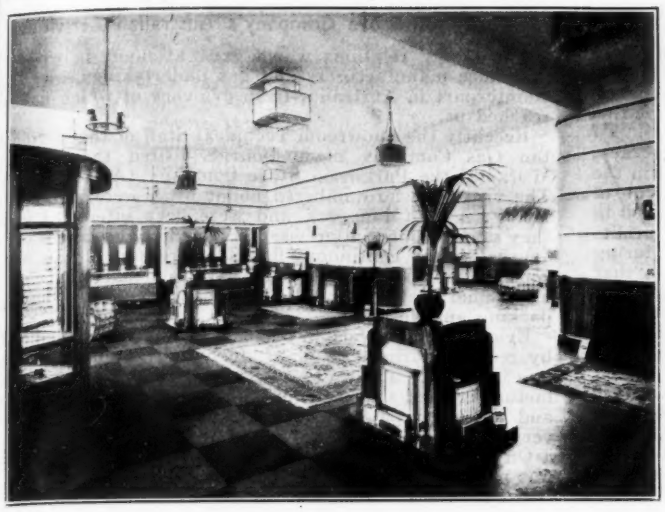


A TOPICAL RICHMOND WINDOW DISPLAY.

The erection of a Traffic Beacon outside Richmonds' (Radiation Ltd.) Queen Victoria Street Showroom was speedily turned to good account by their Advertising Department. A well-lighted and colourful display of "Bungalow" "New World" cookers formed the central feature. The two "Beacons" shown in the window each measured 6 feet high. These were reproduced in realistic colours and pasted flat on to the glass. The quaint little Chef in the foreground draws attention to a large "reader" card which bears the following :

ALTHOUGH THERE'S A BEACON
DONT CROSS WITHOUT LOOKING.
IT'S NOT AUTOMATIC—
LIKE "REGULO" COOKING!

This display was completed within 24 hours of the erection of the Official Beacon, which leads pedestrians straight across to the Showroom Window. This ingenious link-up is attracting much attention.



A Striking View of the Interior.

Bournemouth Company's New Showrooms

These imposing new Showrooms and Offices of the Bournemouth Gas and Water Company were opened last Monday at Boscombe

Built of concrete and surmounted by a tower, the new premises are of ultra-modern design and of striking appearance. At night they will be floodlighted by gas.

The new building, which replaces the old premises near Palmerston Road, is situated at 709, Christchurch Road, Boscombe. It has been designed to serve the growing needs of the residents of Boscombe, Pokesdown, Southbourne, and adjacent districts; and the central situation of the premises will be very convenient for all in the area served.

Already it is a landmark in the main road. It is about 55 ft. wide and 46 ft. high, with a depth of 84 ft.

Revolving swing doors open into a spacious and attractive main showroom on the ground floor. This showroom is well lighted by a spacious laylight with slightly amber-coloured glass. The ceiling lights are specially attractive and, indeed, the entire building is beautifully illuminated throughout, all the lighting being controlled by automatic switches.

In the main showroom are centre-pieces showing the most modern types of gas fires, while a giant palm graces the centre of the floor. At the rear is the cashier's and accounts department.

Beauty and efficiency have been well combined in the new building. A striking feature is the effective manner in which the gas central heating has been carried out. The installation is permanently fixed in the window and can be seen actually operating. It is automatically controlled and heats the whole of the building. The Company have installed similar heating in a large number of stores, banks, churches, flats, and private residences.

A special feature has been made of the window lighting.

In addition to the display of gas fires and cookers—all arranged in attractive settings—there is a recess for hot water apparatus. Actual working models may be seen, and many types of hot water apparatus are displayed.

A fine black mirror upon which is etched the Company's boat William Cash, alongside Poole Quay, being unloaded with a modern crane, and also depicting a gasholder, is a striking feature of the main showroom.

Above is an electric clock, and the whole setpiece is mounted on an attractive mantel of modern design, with a gas fire inset below.

Floodlighted Garden.

At the rear of the showroom one looks out on to a beautiful garden with green shrubberies, neat stonework, and a pond, in the centre of which stands a statuette. The design of the garden is in keeping with the formal character of the building and will be floodlighted at night.

Instead of the usual ugly iron fire escape ladder found at the rear of many buildings, there are attractive stone steps leading up to the first floor.

Above the showroom is a commodious cookery demonstration hall, where a staff of trained lecturers will regularly demonstrate cooking apparatus, and show housewives how to arrive at the exact cost of cooking any meal.

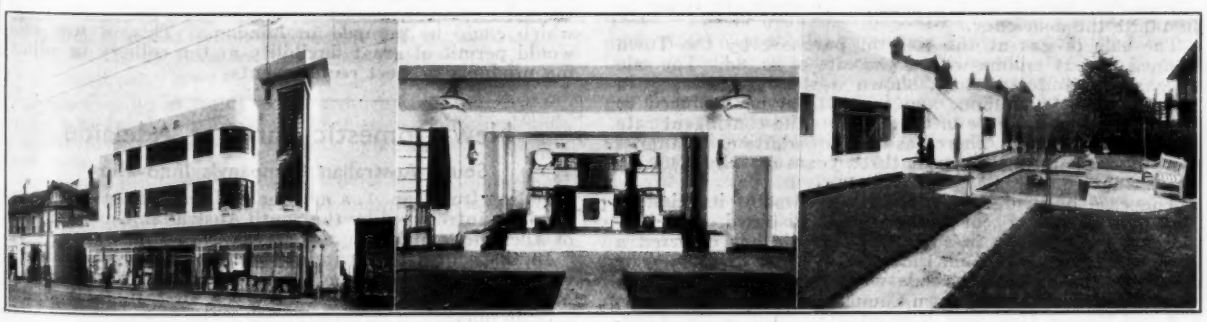
Coffee-making machines for the hotel and restaurant industry and many other domestic appliances are displayed and demonstrated.

A skilled fitter is in residence on the premises to answer and deal with emergency calls at all hours. There is a suite of offices on the second floor.

One of the outstanding features of the new building is an absence of chimney breasts for the many fires, affording increased space in the showrooms. This was made possible by Nautilus economy gas flues. The walls have been finished with "Velteen," a flat oil paint imparting a velvet finish. Inferior woodwork has been painted with gloss paint, to harmonize with the colouring of the walls.

A noteworthy feature of the new showrooms is a style of flooring—new to Bournemouth. The ground and demonstration floors have been laid with "Masonite" tempered pressed wood in two shades, offering a contrast very restful to the eye. It is laid on concrete and bitumen mastic, and is very resilient.

The architects of the building were Messrs. A. J. Seal & Partners, Bournemouth, and the builders Messrs. George & Harding, Bournemouth; the premises as a whole provide a showroom on which the Bournemouth Company are deserving of congratulations.



An Imposing Exterior. Demonstration Platform. The Attractive Garden.

Belfast Gas Department

Application for £100,000 Loan

Belfast Corporation has applied to the Ulster Ministry of Home Affairs for sanction to the raising of a £100,000 loan to meet capital expenditure contemplated to be incurred in the next two years on the development of the Gas Undertaking.

Mr. J. D. Smith, the Engineer, Manager, and Secretary, estimates a balance of £21,000 to be carried forward in the current year after contributing £11,430 for payment of interest and sinking fund on the City Hall and £11,000 in aid of rates. For a number of years the surplus profits have been utilized to meet capital expenditure, and during the last five years over £137,000 has been devoted to that purpose. At the end of the last financial year the total value of the Undertaking was estimated at £2,099,966, the total capital due being £928,975, but against this there was £233,601 in the sinking fund and £187,080 in the reserve funds, leaving a net liability of £508,294.

The Engineer and Manager told his Committee at the last meeting that at the present stage the surplus profits were no longer equal to meeting capital expenditure, and he recommended that a loan of £100,000 should be secured to meet estimated capital expenditure during the next two years. This includes £40,000 for mains and services, £5,000 for lamps, £20,000 for meters, £30,000 for stoves, and £5,000 for plant and machinery.

Sale of Scottish Municipal Gas-Works

Bridge of Allan Undertaking Purchased by Stirling Gas Company, Ltd.

Negotiations between the Bridge of Allan Town Council for the sale of their Gas Undertaking to Stirling Gas Company have been proceeding for several years, and are now concluded.

The price of the Undertaking to be taken over at May 15 is £15,500. This sum does not include cash, book debts due to the Undertaking, or investments at the date of the take over. The Town Council will discharge their debts and liabilities.

The quantity of gas sold for the year to May 15, 1934, was 16,273,300 c.ft., and the price obtained is therefore equal to £952 per million sold. The agreement of sale provides for a substantial reduction in price to Bridge of Allan consumers—the existing rate of 6s. 8d. per thousand will be reduced to 4s. In addition to the 6s. 8d. rate to consumers, there has been imposed on ratepayers for the past 10 years a gas contingent rate of 6d. in the pound, equal to one shilling per 1,000 c.ft. on the quantity of gas sold. The Bridge of Allan Town Council undertake to continue the use of gas exclusively for the lighting of streets for a period of ten years from the date of the take over. Stirling is about 3 miles distant from the Bridge of Allan.

The capital price to be received for the sale will not be sufficient to liquidate the outstanding loans of the Undertaking. The purchase price of the Undertaking in 1914 from the Bridge of Allan Gas Company, including expenses of arbitration which amounted to about £6,000, was £34,679, with an annual sale of about 24 million c.ft. The total sum borrowed up to May 15, 1934, was £40,000, and, deducting payments to sinking fund, the amount of loan debt is £26,544. The deficiency to be met by the Town Council is, therefore, about £13,500. When the sale of the Undertaking to Stirling Gas Company has taken place, the Town Council, having divested themselves of their Undertaking, will no longer be able under the Burghs Gas Supply (Scotland) Act, 1876, to impose a gas contingent rate. It will be necessary, therefore, for the Town Council of Bridge of Allan to obtain a Provisional Order, or, if necessary, a Private Bill, to enable them to impose a tax on ratepayers, spread over a number of years, in order to liquidate the deficiency.

The sale of gas at the time of purchase by the Town Council was 24 million with a gas rate of 3s. 8d. The sale of gas has, unfortunately, shown a steady decrease; in 1930 it was 17¼ million, and in 1934 further reduced to 16¼ million, with a rate of 6s. 8d., *plus* the contingent rate equal to 12d. extra. There has been, in addition, an annual working loss during the past three years of fully £400 on an average.

The case of Bridge of Allan is the first of its kind in Scotland where a Local Authority has disposed of its gas-works. It is unique in so far as the sale has incurred a debt to be recovered from the community of £13,500. The final negotiations for the sale were carried out and completed on behalf of the Town Council by Sir D. Allan Hay, C.A., of Messrs. Grahams, Rintoul, Hay, Bell, & Co., Chartered Accountants, Glasgow, and Mr. J. W. Napier, Gas Engineer, Alloa.

A Tour of Melbourne Gas Appliance Works

Parkinson Stove Company's Australian Activities

The happy relations which exist at home between gas appliance manufacturers and gas undertakings have their counterpart in Australia, fresh evidence of which has just reached us.

Recently the Showroom Technical Staff of the Metropolitan Gas Company of Melbourne visited the Footscray Works of the Parkinson Stove Company (Australia), Ltd. The visitors, who numbered about fifty, were received by Mr. F. Ayre (Manager), and were very interested in all they saw. Appreciation was expressed of the layout of the Works, giving continuous flow from receipt of raw materials at the foundry, through various departments until, after final test, the appliances reach the warehouse for packing and despatch.

Evidence of recovery in business in Australia is indicated by recent additions to plant, including extended enamelling facilities. The up-to-date nature of this gas appliance factory created a most favourable impression, and the care and attention paid to each process of manufacture was very obvious.

On the conclusion of the visit a hearty vote of thanks was passed to the firm for their hospitality.

Pithead Carbonization

Institute of Fuel Discussion

The Institute of Fuel held an informal meeting on Friday, Jan. 25, at the British Industries House Club, when a discussion took place on "The Cost of Production, Transport, and Distribution per therm of various Fuels relative to the prices paid by the Consumer." It had been the intention to have the discussion opened by Mr. Stephen Lacey, Gas Light and Coke Company, to deal with gas and coke. Mr. Lacey, however, was represented by Mr. E. G. Stewart, Assistant to the Chief Engineer of the Gas Light and Coke Company.

Mr. Stewart commented on proposals that have been made from time to time to replace gas-works in towns and cities by large works concentrated near the coalfields, the gas being transported by long pipelines. The transport of coal for 100 miles by rail costs approximately 10s., and for 200 miles 14s. 3d. per ton. If the gas-works were located at the coal pits, this cost would necessarily be eliminated, but it would be necessary to transport to the towns for use there the gas, coke, and tar. The cost of transporting the gas produced from one ton of coal would be 6s. 3d. over a distance of 100 miles and 9s. 7d. for 200 miles. The costs for transporting the coke and tar would be respectively 6s. and 8s. 6d. for the two distances mentioned, so that on transport alone there would be an extra cost incurred of 2s. 3d. for 100 miles and 3s. 10d. for 200 miles per ton of coal carbonized. These losses were based on railborne coal, and, said Mr. Stewart, when it was realized that coal can be brought by sea a distance of nearly 300 miles from the Durham coalfields for about 3s. 6d. per ton of coal, or 10s. per ton less than by rail, it would be appreciated that pithead carbonization as a general proposition offered no advantages.

A closer linking up of town gas supplies with supplies from coke ovens was urged by a gentleman associated with the work of the Area Gas Committee, as a means of reducing the cost to the consumer. There was some exception taken to the view expressed by Mr. Stewart concerning the transmission of gas from the coal pits. The point made was that in any case gas has to be compressed to a certain pressure for ordinary delivery, and it was also urged that it would not be necessary to transport the coke from the pits to, say, London if it were made as metallurgical coke, for which there would be a local market. Then some of the coke could be used for the manufacture of water gas, which could be pumped to London. This, it was said, would permit of great flexibility at the colliery in adjusting products to meet requirements.

New Domestic Tariff at Adelaide

South Australian Company's Innovation

Dating from Jan. 1, a new scale of domestic rates for gas has been introduced by the South Australian Gas Company, of Adelaide, embodying a "service charge."

In the course of a wireless broadcast in explanation of the new tariffs, Mr. G. M. O'Dea, Secretary and Business Manager of the Company, observed that there is to-day a large number of consumers using the gas service only as a convenience such as, for instance, for the morning tea, the shaving water, and, perhaps, a quick breakfast. The

consequence is that their gas accounts are very small, amounting to as little as 11d. or 1s. 10d. a month. Now, in such cases there can be no profit to the Company—in fact, there is a loss. Seeing that these consumers have available at every minute of the 24 hours the ever-ready convenience of the gas service, the Company feels that they should pay a reasonable charge for this convenience and that this is only just to those consumers who use gas in larger and payable quantities. Consequently, as is the case with many other public utilities such as electricity, water, telephones, and so on, a small service charge will be made, but a substantial reduction in the price of gas after the first 400 c.ft. will be conceded—viz., from 9s. 4d. to 7s. 3d. a reduction of 2s. 1d., or 22%. This will make gas cheaper than any other fuel notwithstanding the meter rent or service charge, and will ensure to consumers substantial economies in its use not only for cooking, but for all other heating.

A service charge meets the cost of various services rendered to all consumers, including a considerable amount of attention by the Company to their gas appliances not hitherto charged for in any way. Many people have the impression that this meter rent or service charge is being added to the present price of gas without any compensating reductions. This is not so. The actual effect of the tariff as far as the charge to consumers is concerned, is that all present accounts of under 9s. 4d. will be subject to very small increases ranging from, in no case as much as 1d. a day, down to as low as 2/7ths of a 1d. a day; and, on the other hand, all accounts now over 9s. 4d. will be reduced by amounts which will increase according to the consumption of gas. By far the majority of consumers will obtain relief, and it is not a fact that it will be only the poorer classes of consumers who will be called upon to pay the small increase referred to.

A further innovation is that gas in future will be charged for by the gas unit, which contains precisely the same amount of heat as a unit or kelvin of electricity. This will enable consumers to form comparisons between the prices of these two fuels. The tariff is on lines similar to what prevails in other utilities in Adelaide and to what has been adopted with great success in both the gas and electricity industries, not only in nearly every other city in Australia, but world-wide.

GAS HEATING BY
Radiant Surface Combustors

The Cox Surface Combustion System for industrial gas applications and catering purposes has been in use for a number of years; but its use for space heating, as described in the following article, is a comparatively new development with many points of interest to the Gas Industry.

The radiant heating of churches, halls, factories, and other large buildings has in the past presented a number of difficulties; and it is thought that a few notes on the subject of the Cox surface combustion system, as recently developed by Radiant Heating, Ltd., whose works at Harmood Street, Chalk Farm Road, N.W. 1, we recently had the opportunity of visiting, for such applications, may be of general interest, providing as it does a new outlet for gas in an exceedingly efficient manner.

The main principle of this method of heating involves the installation of the gas combustors on the walls of the building to be heated, as is clearly illustrated in the accompanying photograph. The circular combustors in this case

Cox Radiant Unit Gas Heaters fixed on the walls of St. Saviour's Church, Goodinge Road, London, N. 7.

are inclined at an angle of 45° in a downward direction so that an equal distribution of the heat rays is obtained and no undue heat is felt by occupants being directly underneath them.

Combustion products, of course, rise on the ascending hot air, and a healthy atmosphere is maintained with this system of heating.

The combustors need not, of course, necessarily be fixed up on the walls as shown in the photograph, though this position is probably as good as any for the type of building illustrated. The mere act of lighting the combustor causes the heat waves to actuate outward from the units, which may thus be suspended from lofty ceilings and throw their heat downward.

The Combustor.

The medium in which the gas is burnt is known as the Cox patent radiant combustor, and consists of a cast burner box into which is inserted a porous refractory brick made from a special formula evolved by the patentees. A fractional horse-power electrical motor provides the air at a pressure of 3 in. W.G. necessary to promote efficient combustion on the surface of the refractory. It may be mentioned here that the necessity for an electric motor precludes the use of the combustor, generally speaking, in purely domestic applications.

When the combustor is first lighted a blue film spreads across the refractory, which, within the space of less than a minute, develops into an orange-red radiance over the whole surface. In other words, the face of the combustor glows intensely and throws off a remarkable heat without any sign of actual flame whatever. The temperature on the surface of the refractory is about 900° C. Even very large halls may be heated up in quite a short time.

A unit of the type illustrated consumes 50 c.ft. of gas an hour, which, of course, is not appreciably greater than the consumption of the average gas fire. The life of the refractory brick we were informed by the makers is at least five years.

Fields of Application.

There is almost no limit to the range of shapes in which the refractory brick can be produced. The combustor can thus be applied to a variety of advertising applications in novel shapes, such, for instance, as the " Mr. Therm " type recently evolved to the specification of the Gas Light and Coke Company. This model measures 2 ft. high by 18 in. across, and the weight of the whole is about 50 lbs. When alight, Mr. Therm gives out a radiant glow, his well-known eyes and nose being clearly visible. It is understood that Radiant Heating, Ltd., are now producing these models in various sizes, including one 15 in. high for counter display; and these should make a wide appeal to gas undertakings for publicity purposes.

It is interesting to note that this combustor also works efficiently in out-of-doors or semi-open positions, so that the system has many potential applications in the direction of heating racecourse or football stands, shopping arcades, or even, perhaps, railway stations; and we understand that the Gas Light and Coke Company are now formulating a scheme for the heating by this system of portions of two of the halls at the White City section of the British Industries Fair by means of surface combustors of 10 in. diameter.

There should undoubtedly be a wide field for the future application of this type of heating, and the Gas Industry will watch its development with interest.

The Marketing of Coke

by F. M. H. TAYLOR

Coke for Steam Raising

Mr. F. M. H. Taylor, Ph.D., M.Inst.Fuel, M.I.H.V.E., continues his series of articles dealing with specialized phases of the gas coke market, other contributions to which by the same Author have appeared in recent issues of the "JOURNAL."

Comparisons of Coal and Oil.

The tests published in last month's article ("JOURNAL" for Jan. 2, p. 32) indicated the highly satisfactory results now obtainable by using coke fuel as compared with its chief rivals, coal and oil, on various types of steam raising boiler plant. Equivalent evaporations of 8 to 10 lbs. per lb. of fuel, according to the boiler, represent efficiencies of between 70 and 80% and show that steam raising practice can compare very favourably with the recent improvements in central heating, notably the advent of the hopper fed central heating boiler, and automatic control of boiler operation.

While the advantages of natural draught were stressed in the previous article, it is frequently found that forced draught is necessary and the conditions under which a suitable forced draught system may be adopted are well worth considering. The advantages of forced draught are these:

1. A higher load may be obtained from the boiler.
2. A balanced draught enables the losses due to in-leakage of air over the fuel bed through cracks in the furnace door to be avoided.
3. Forced draught allows the fitment of simple types of automatic control of steam pressure, so that excessive fuel consumption may be avoided with fluctuating loads, and also that sudden demands for steam may be met with the least possible delay.

Types of Forced Draught Equipment.

The most simple type is a pressure ashpit device whereby a fan or steam jet forces air into the ashpit of the furnace, which then builds up a slight pressure in the ashpit and assists the draught through the fuel bed. This gives most of the advantages claimed for forced draught furnaces generally, but has the one limitation that the distribution of air is most haphazard, and may lead to blow-holes, excessive clinker formation, and even local overheating, resulting in the burning-out of grate bars. A much more satisfactory type is the special grate, made in sections, containing air tubes running the whole length of the furnace. These sections are so spaced that the tendency to build up pressure at the back of the grate through the momentum of the air stream is counteracted by closer spacing, and as a result an even distribution of air supply is obtained throughout the whole of its length. Between four and six types are now on the market. Fig. 1 illustrates the type of furnace. Forced draught may be obtained from a fan connected to the furnace by sheet iron ducting, constructed to give the minimum back pressure and to avoid interference with the normal attentions to the fire. Perhaps the most widely established type of forced draught system has steam jets placed at the entrance to the ashpit or grate, according to the type of furnace used. The steam jet is designed on the venturi principle, the size and shape of the jet being arranged to induce the required volume of atmospheric air. The quantity of steam used should not be more than 3 to 4% of the total quantity of steam raised, and it is advisable to check up the steam consumption of an installation frequently, as the jets tend to wear, and if they become even slightly enlarged they lose efficiency very rapidly, and in actual practice consumptions have reached as high a figure as 15% of the quantity of steam raised. This has been one of the chief objections to the steam jet, and frequently the fan formed draught is adopted for that reason.

Automatic controls may be applied to steam jets, although the apparatus is rather more complicated than that of the fan forced draught, usually consisting of the operation of diaphragms which are magnified by relays and incorporating specially designed valves. Steam jets have the great advantage of improving the type of clinker formed in a steam raising coke boiler, and it is very often necessary to have a wisp of steam under the grate even if fan forced draught is used. The admission of steam gives the water gas reaction on the surface of the grate bars, and by the formation of carbon monoxide and hydrogen from the hot fuel, cools the lower part of the fuel bed sufficiently to ensure the formation of a light and friable clinker which can easily be removed and does not damage the grate bars. The hydrogen and carbon monoxide formed are later burned off by the air admitted. For this and for reasons of security the usual practice is to fit both steam jets and a fan in a forced draught installation. The forced draught fan or steam jet should be designed to give an air supply of approximately 20 lbs. of air per lb. of coke consumed at the maximum output of the boiler which may possibly be reached. Although this means that the fan is apparently delivering an unduly high quantity of air it is comparatively easy to throttle this by means of a damper in the ducting, or, where automatic control is employed, to cut the fan in and out by means of a switch. A certain quantity of excess air is required to ensure complete combustion of the coke, and an excess of up to 30% does not have a very serious effect on the efficiency of the boiler. The additional quantity allowed has the advantage that a slip in the fan or any bends in the ducting setting up back pressure are adequately compensated for.

The disadvantages of forced draught equipment which must be taken into account are:

1. That forced draught is apt to give clinker trouble on certain types of coke of low ash fusion point.

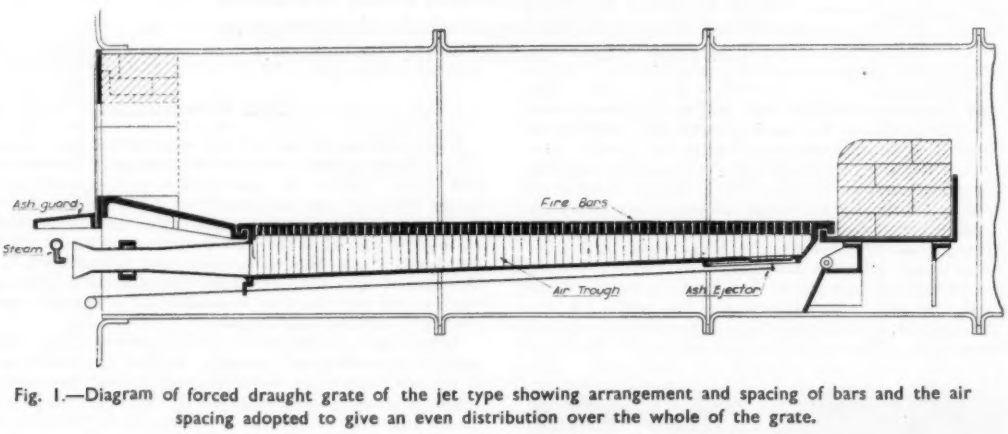


Fig. 1.—Diagram of forced draught grate of the jet type showing arrangement and spacing of bars and the air spacing adopted to give an even distribution over the whole of the grate.

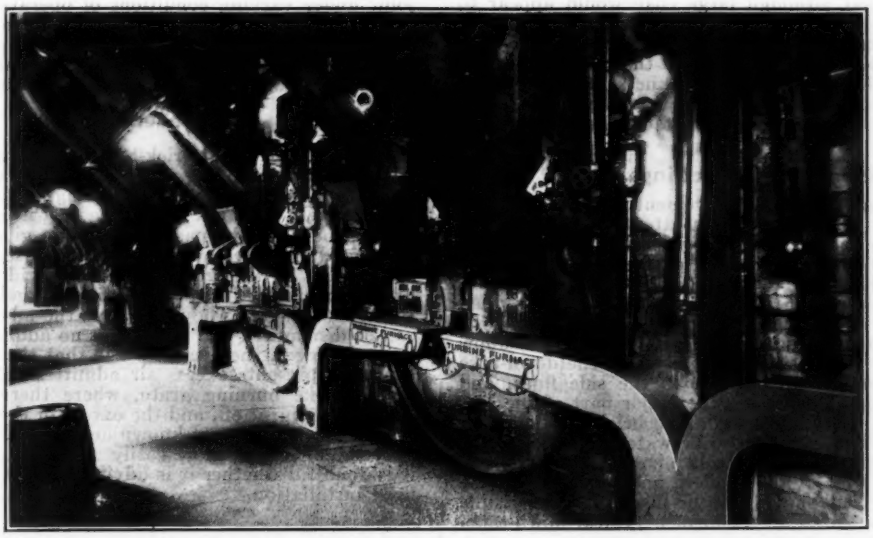


Fig. 2.—Typical installation of fan forced draught system (by courtesy of the Turbine Furnace Company).

2. The increased rating of the boiler causes a drop in the efficiency of heat transfer. This is owing to the fact that there is a lower proportion of radiant heat transfer to transfer by forced convection from the flue gases with the coke boiler than with competing fuels, and a given rate of combustion requires a larger surface in order effectively to abstract the heat from the flue gases.
3. It tends to encourage the substitution of cheap grades of coal or breeze for grades of large coke.

Rates of Firing.

The rate of firing steam boilers varies from 5 or 6 lbs. of coke per square foot of grate area per hour to approximately 25 lbs. per square foot. If necessary this can be raised to 30 lbs. for periods of short duration. For rates of firing up to 16 lbs. or more under favourable conditions a natural draught system is employed. Where a higher rate of combustion is required forced draught furnaces are fitted, as previously described.

Labour Costs.

As a guide to the amount of stoking necessitated, one stoker would be required for each 1,000 to 1,500 tons of coke consumed per annum, or for each 12,000 lbs. of steam per hour from steam boilers. For the great majority of smaller installations only a portion of the stoker's time is required, and in practice he has a number of other duties to perform in addition to the attention required by the boiler. It can be seen that the labour costs on a hand-fired installation amount to only 10 or 15% of the fuel costs and do not affect appreciably the comparison between coke and more or less automatic oil-fired installations.

The Stoking of Coke-Fired Boilers.

The stoking of coke boilers requires a special technique, which is not at first appreciated by the average stoker who has been used to coal all his life. It is usually necessary to give special instructions to the stokers on a plant when first adopting coke, but after a few days its firing presents no special difficulties, and it is in fact easier to obtain reasonably high working efficiencies with coke than it is with coal. The fuel should be fired, just as with coal, in small quantities, with frequent additions, the main object being to maintain a perfectly even fuel bed over the whole grate. A thickness of 7 in. to 9 in. gives optimum results according to the grade of coke used, and this is independent of the rate of firing of the boiler. On no account should changes in load be met by changes in depth of fuel bed, but should be arranged entirely on damper operation. Stokers are apt to believe that the bigger the fire the more is the heat produced, and conversely that when on low load conditions they are justified in allowing the fire to drop to a very low state.

These simple rules have been confirmed by actual observation as well as by gas analyses, and results have been obtained such as were published in the "JOURNAL" for Jan. 2, giving efficiencies of up to 80%. Evenness of fuel bed is of great importance, as fluctuations in the thickness cause excessive combustion in the thin parts, leading to blow-holes and treacly clinker formation, as well as causing excess air to be admitted into the combustion chamber.

Cleaning the Fire.

Clinkering is carried out while the furnace is brought to its lowest rate of combustion by closing the flue damper, on natural draught; or on forced draught installations by balancing the draught as nearly as possible, so that inleakage of air into the flues may be reduced to a minimum. The fuel is turned onto one side of the grate, leaving the clinker to be drawn off with a special tool. The fuel is then transferred to the clean half of the grate, and the remainder of the clinker removed, when the fuel is re-distributed over the whole of the furnace, and a fresh charge applied.

The Grade of Coke.

The grade of coke most suited to steam raising boilers has proved to be a 2 in. by 3 in. size, or a large coke from which all pieces over 3 in. have been screened. Compared with other large unscreened coke or with smaller grades

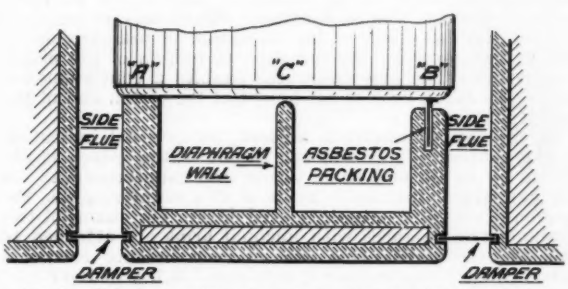


Fig. 3.—Shows a section of a combustion chamber down-take on a Lancashire boiler and the various methods used in construction.

such as broken coke, the 2 in. by 3 in. size has the following advantage in actual practice:

1. Absence of treacly clinker at quite high rates of combustion.
2. Higher rates of combustion, and therefore higher output on boilers on the same draught conditions.
3. Higher all-round efficiencies on boiler plant.

The critical nature of the transition from small to large cokes in their behaviour in the furnace is not entirely explained, but Mr. R. A. Mott[1] in his paper to the Midland Section of the Coke Oven Managers' Association in December, 1934, has put forward the results of careful tests. These tests confirm the view that the 2 in. by 3 in. size of coke combines large surface in a given bulk with low resistance to the passage of air through the fuel bed, and at the same time avoids a very close packing. Close packing generates an intensely high temperature close to the grate, thus giving soft clinker on the firebars, and is normally associated with small grades of coke. It must be

borne in mind that although large coke would appear to have a lower resistance to the passage of air through the fuel bed, this coke would need a thicker fuel bed to obtain complete absorption of the oxygen by the coke in forming carbon dioxide, and the greater thickness required would more than counterbalance the looser packing of the coke. This explains the higher ratings that can be obtained on boilers fired with the 2-3 in. grade.

Steam Boiler Settings.

Very often considerable improvement can be made in the operation of steam boilers by attention to small details of the boiler setting, and if any trials are to be made on coke it is obvious that these should be carried out as far as possible under the best conditions. Boiler settings have been described in great detail in a paper by Mr. A. T. Lambert.[2] Such defects as badly fitting dampers, poor expansion joints, and badly built fender walls, allow gaps which cause the gases to by-pass from the down-take of the combustion chamber direct to the side flues, and thence to the stack, thus losing the major part of the sensible heat of the gases. Cracks in the brickwork and the side walls of the boiler must also be watched, and pointed up to avoid the in-leakage of cold air. The joint round the front brick wall of the boiler, and that round the blow-down recess wall should also be inspected for possible air leaks. Fig. 3 shows a section of a typical down-take. (*a*) Indicates a fender wall built tight to the boiler, which allows a gap to develop on the expansion and contraction of the boiler in normal operation. (*b*) Shows a suitable form of expansion joint, which provides for a gas-tight joint under varying conditions of operation, and prevents short-circuiting, which would occur if the walls were built as illustrated in (*a*). There are several proprietary types of expansion joints which serve the purpose admirably, and these, of course, extend to the cover of the down-take.

Furnace Bridges.

Instead of the usual brick-built bridge, which has the disadvantage of requiring re-setting after each annual boiler inspection, and is liable to damage from stoking tools, some makers have put forward a cast-iron bridge, with an arrangement for the passage of air to give a cooling effect and avoid excessive overheating, and also to give sufficient combustion on the front side of the bridge, resulting in a bright fire instead of the dull fire normally obtained with the brick bridge. They also have the advantage that they can be dismantled and re-built at no additional cost. They have, however, the disadvantage that the air necessary for cooling represents excess air admitted into the flue space with a coke burning grate, where there are no volatile gases to be burnt off, and the extent of the loss in efficiency due to this cause is not known accurately. For this reason they are obviously more easily adapted to coal firing, and it is doubtful whether it is advisable to fit them on a coke-fired installation.

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[1] R. A. Mott. "The Use of Coke for Heating Purposes." Paper read before the Midland Section of the Coke Oven Managers' Association, December, 1934.

[2] A. T. Lambert. "Boiler Settings." Report of the Institution of Heating and Ventilating Engineers, 1928-29, Vol. 27.

Continental Notes

Measurement of the Piston Height and Friction of Waterless Holders

W. Ruppert in *Das Gas- und Wasserfach*, 1935, **78**, 57-60 (Jan. 26), describes apparatus made by Hydro Apparate-Bauanstalt G.m.b.H. of Düsseldorf for continuously recording the height of the piston and the friction of waterless holders.

Proper control of waterless holders necessitates a continuous supervision of the friction of the piston. The conventional method of measuring or recording the pressure at the base of the holder is inadequate, since the pressure at that position depends on the position of the piston and falls off linearly with increase in the height of the piston due to the buoyancy of the gas. It gives no indication of the friction, since, in the case of a holder 250 ft. high, pressure changes due to buoyancy effects may be as great as five times as much as the alteration in pressure effects due to friction when the direction of motion of the piston is reversed. The new apparatus enables a continuous record to be taken both of the height of the piston and of the actual friction.

In the case of waterless holders, an external indication of the content of gas and the height of the piston is obtained by means of a chain device and counterweight. In the new apparatus, use is made of this counterweight, the motion of which is suitably geared down. The chains of two chainometric balances with unequal arms are attached to this counterweight. One arm of each balance carries a vessel which becomes loaded with more or less of the corresponding chain depending on the position of the piston of the holder. The free arm of each balance carries a pen. The free arm of the first balance moves up and down with the movement of the piston, and its pen records the piston position on a chart mounted on a vertical drum making one revolution in 24 hours. In the case of the second balance, the free arm is moved upwards by a pressure bell connected to the bottom of the holder. The upward movement would correspond to the algebraic sum of the pressure due to the weight of the piston, the buoyancy of the gas and the friction. The chainometric device at the other end of this balance provides an opposite or compensating movement of the balance arm equal in amount to the buoyancy of the gas, since, as was indicated above, the buoyancy effect is a linear function of the position of the piston. Hence the net movement of the pen arm of the second balance represents the algebraic sum of the piston pressure and the friction. The pen of the second balance records on the same drum as does that of the first balance, but works over the lower portion of the chart. Each portion of the chart is suitably graduated and the friction scale is a very open one.

When the piston is stationary, the second pen records a horizontal line at a height corresponding to the actual pressure thrown by the piston, compensated for buoyancy. When the piston commences to rise, the line rises to a new horizontal level at a distance above the first or datum line equal to the frictional pressure. Similarly, when the piston commences to fall, the line falls vertically to a level below the datum line. If any abnormal friction occurs, due, for example, to the piston becoming tilted, a curved line reaching to an unusually high or low level is traced. Contacts operating an audible or visible alarm are attached so that warning is given of any temporary or permanent abnormality of the friction.

The whole apparatus is very compactly arranged in a single casing. Suitable means are provided for setting the apparatus when it has been installed and for adjusting the zero.

Pressure and Temperature Stresses in Coke Ovens

A dissertation on pressure and temperature stresses in coke ovens, by C. Koppel, forms the subject of Report No. 61 of the German Coke Oven Committee, and appears in *Glückauf*, 1935, **71**, 33-39 and 60-65 (Jan. 12 and 19).

The subject is discussed from the aspects of (1) the force exerted on the buckstays as a result of the reversible and permanent expansion of the oven walls, and (2) the quality of the refractory materials. From the flexure and mechanical characteristics of the buckstays, the magnitude of the stresses set up can be calculated and is shown to be very large, particularly when badly converted silica bricks are employed. Buckstays of unnecessarily high strength lead to the distortion of the brickwork and the opening up of the joints of the oven walls. Care is necessary in the tightening up of the bracing during the heating up of the battery and the use of pressure indicators is desirable.

The underload characteristics of silica bricks are discussed, and emphasis is laid on the need for the use of well-converted bricks rich in tridymite, since such bricks have a considerably higher underload refractoriness than have badly-converted bricks containing much cristobalite and quartz. The German standard specifications for silica bricks for coke ovens merely require that 80% of the bricks tested shall show a specific gravity not exceeding 2·38, and that no sample shall show a specific gravity exceeding 2·40. They thus fall far short of being sufficiently stringent, and they allow of the use of material which would not be considered satisfactory in England. As a result, the life of a German battery, or of some of the ovens contained in it, is often much shorter than would otherwise be the case, and during part of this time, loss of valuable bye-products occurs due to leakage.

When bricks of poor quality are employed, it is particularly harmful to bring the battery into commission too rapidly. After the customary slow heating up period, such a battery must be allowed to soak for a considerable period at a high temperature before the first charge is introduced, in order that the bricks may mature and undergo crystallographic changes which increase their under-load resistance.

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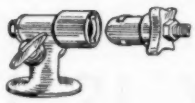
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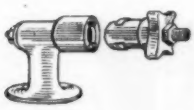
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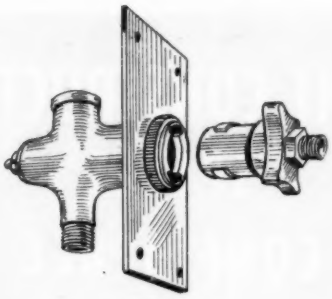
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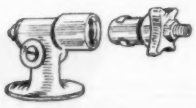
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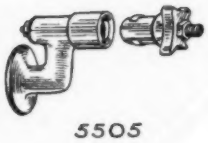
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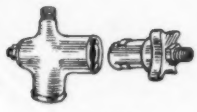
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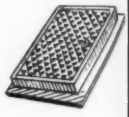

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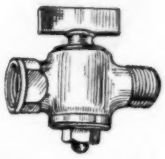
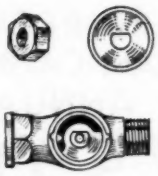


NEW NITING WASHER



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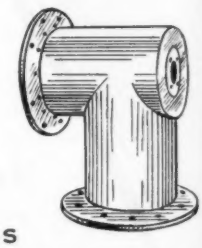

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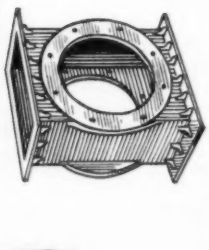

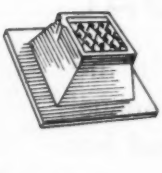

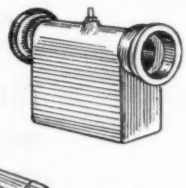

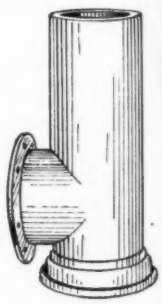

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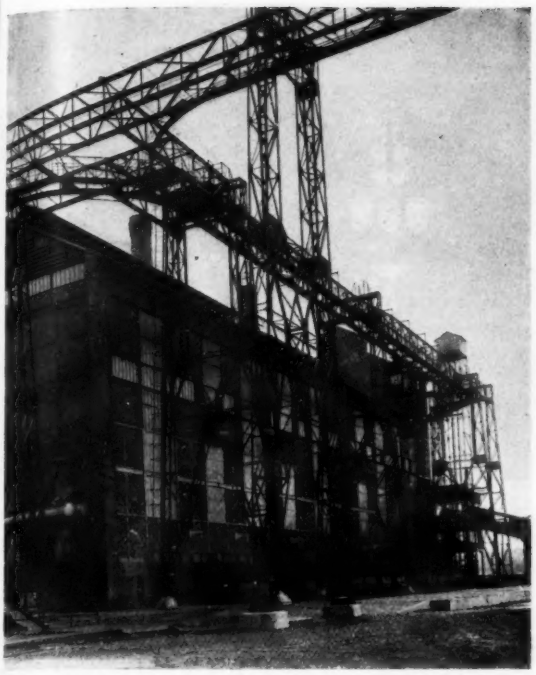


Glover-West Vertical Retort House and Coke-Handling Plant at Nanterre.

Modern Carbonizing and Handling Plant at Nanterre Works

The Nanterre Gas-Works of the Société Lyonnaise des Eaux et de l'Eclairage is situated on the left bank of the Seine approximately eight miles N.W. of the centre of Paris. It is connected with a system of high-pressure mains, one of which extends in a northerly direction for a length of 47½ miles and carries gas at a pressure of about 10 lbs. per sq. in., and another westward for a length of 34 miles, carrying gas at a pressure of about 11½ lbs. per sq. in., following respectively the lines of the Seine and the Oise. The following is an abstract from *West's Gas* of an article in the *Journal des Usines à Gaz*, describing the visit of the June Congress of French Gas Engineers and Managers to the works.

From 1930 to 1934 the Nanterre Gas-Works has been entirely reconstructed and modernized as far as possible without interrupting manufacture; to-day it can supply 7¾ million c.ft. per day.

The coal-handling plant in particular has been studied on the most modern lines, combining the maximum of efficiency with the maximum of security. An illuminated panel permits the operating engineer to ascertain instantly and at any moment what plant is in motion and the course followed by the coal. Thanks to a table of push buttons it is equally possible for him to put all the plant into automatic operation, or to disconnect the several pieces of plant in order to actuate a single piece, as, for example, to test it after repair or adjustment, to put into operation or to stop a series of connected plant by operating the valves (slide doors, &c.) and the push buttons.

Carbonizing Plant.

The carbonizing plant consists of 14 settings, each of eight retorts of the Glover-West continuous vertical type, each retort capable of distilling 4½ tons of coal per 24 hours. The fuel gas for the settings is generated in a battery of Marischka producers with automatic charging and continuous mechanical clinkering. These producers are employed here for the first time for the heating of Glover-West vertical retorts. As the fuel gas reaches the settings cold it is necessary to preheat the secondary air. Recuperators have, therefore, been provided, which utilize a portion of the heat of the waste gases, which, however, leave them at 500° and permit a further recuperation in the boilers.

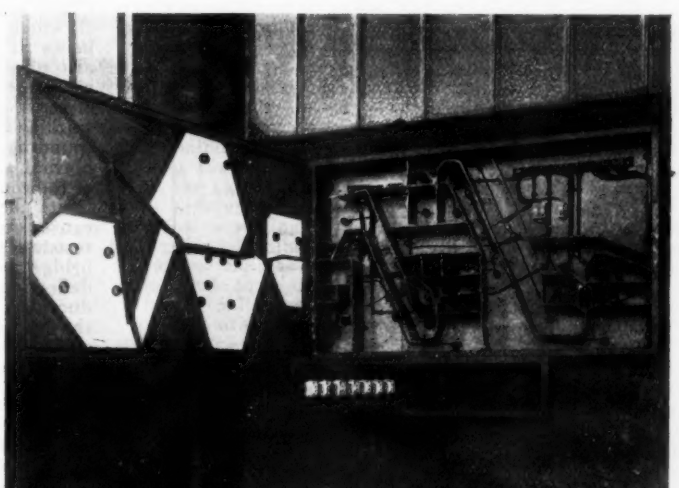
The dry purification plant is quite recent, having been installed in 1930. It is the first of this kind to be installed in France. Its capacity is 5,650,000 c.ft. of gas per 24 hours. The purification is carried out in four boxes of mild steel sheets, about 26 ft. by 26 ft. by 13 ft., each containing seven layers of purifying material.

The distributing valves permit the division of the gas into seven parallel streams and the reversal of direction of flow in each box by means of three-way valves protected by water seals. The order of passing through the boxes can be varied, any one box can be cut out of the circuit, and the flow can be reversed in order to get the best results from the purifying material, according to its age, and to obtain a constant purification.

Continuous revivification is effected by air supplied from a geared compressor controlled by a venturi meter with continuous indication. Water vapour is injected into each box to avoid drying of the material and thus to ensure the chemical reactions. A manometric panel indicates the pressures of the inlet and outlet of each box and of the installation. The temperature is also carefully controlled.

Coke is transported from the retort house to the sorting plant by means of an overhead "telpher." The rail is 72 ft. above the ground. Two machines, each capable of elevating and transporting a skip of 2,400 litres capacity (about 17 cwt.) are connected to an operating cabin, from which the operator can control all the necessary movements to discharge coke to the silos or trucks, return it to the retort house, and supply the Marischka producers.

The coke grading plant is placed between the coke store and the yard for the charging of road vehicles. The works is thus freed of these, and the rapid transport of coke to the points of sale is facilitated. The coke store, situated between the railway and a water basin, 300 metres long, connected with the Seine, is served by an overhead electric transporter of 60 tons per hour capacity. The coke intended to be screened may be transported by overhead wagons or it may come from the coke store. In the latter case it is lowered by the transporter into underground hoppers connected by band conveyors with the central pits of the grading plant. The coke for stocking is discharged from skips with opening sides placed on trucks circulating on the railway below the transporter, which raises them and deposits the coke without fall. The telpher skips filled from the retorts can be taken by the



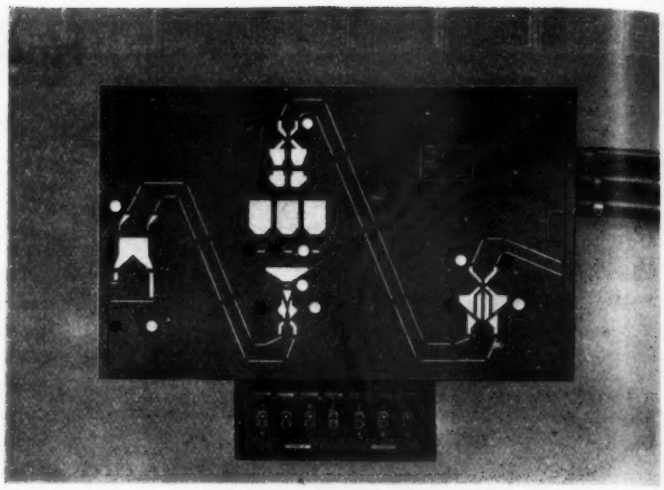
The illuminated Indicator Panel, which reproduces all operations in the handling system at the Nanterre Gas-Works, shown open.

transporter for distribution on the store without passing over the grading plant.

The grading house, of a height of 114 ft. and a length of 246 ft., is composed of two symmetrical wings capable of functioning individually.

The coke skips are fitted with automatic electrical apparatus, which controls the starting, travelling, braking, and stoppage for a variable time for filling and emptying. The skip deposits the coke in a preliminary hopper, which can feed either a coke cutter or a preliminary "de-breezer" of the drum type. The unbroken "de-breezed" coke coming from this drum is fed either to a silo or graded over a roller-grid. Material passing over this apparatus goes to a second drum, and, finally, to the last silo. The operation of all this plant is controlled from a central station.

The coke for sacking is first de-dusted over a vibrator, which removes dust formed in the silos. The sacking floor is arranged at 14 ft. above the ground level to facilitate the loading of road vehicles.



The Indicator Panel shown closed.

The Measurement of the Rate of Air Change

by W. G. MARLEY

This contribution by Mr. W. G. Marley, M.Sc., of the Building Research Station, Watford, is reprinted from the January issue of the Journal of the Institution of Heating and Ventilating Engineers.

For some considerable time the need has been felt of a simple method of measuring the rate of ventilation. A knowledge of this quantity is valuable in the design of heating systems, but in the majority of instances only a vague estimate of it has hitherto been possible. Occasionally, the air velocity in supply ducts can be measured, but frequently a system of ducts is not employed and the task of determining the rate of air change becomes one of considerable difficulty.

In experiments conducted at the Building Research Station in 1927[1], the ventilation of a room was determined by measurement of the increase in carbon dioxide consequent upon the burning of three standard candles for three hours. A 2·5 litre sample of air was taken by means of rubber hand-bellows, the flask being moved round the room about 3 ft. 6 in. from the floor, and the carbon dioxide was estimated by absorption in barium hydroxide and titration of the excess with oxalic acid. Using this method of measurement the efficacies of an unheated flue and a wall ventilator were compared.

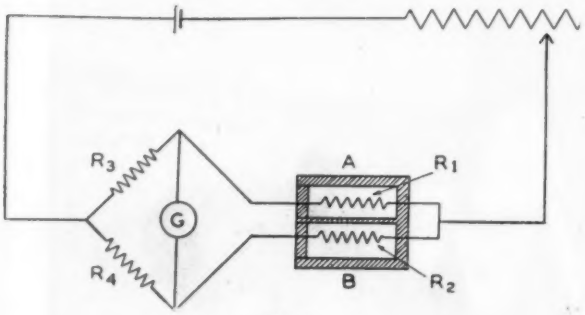


Fig. 1.

Experiments have been made to investigate the possibility of utilizing the rate of supply of steam, necessary to maintain an increased water content in the air of the room, as a measure of the rate of ventilation.[2] This method proved unsatisfactory, however, owing to the absorption of water vapour by the walls, and furniture of the room.

Hydrogen Method.

A simple accurate method has now been devised, based upon the fact that, if a small quantity of hydrogen be released into the air of the room, the rate of decay of concentration affords a measure of the rate of air change.

The thermal conductivity of hydrogen is seven times that of air and, consequently, traces of this gas in air can be readily estimated by a careful measurement of the thermal conductivity. This is conveniently performed with a katharometer, an instrument devised by Shakespear[3] and now used commercially for the determination of carbon dioxide concentration in flue gases.

The Katharometer.

Two spirals of platinum wire R_1 and R_2 (fig. 1) having identical resistances, are enclosed in separate cells A and B, which are located in a solid copper block to ensure their being at the same temperature. Each spiral forms one arm of a Wheatstone bridge circuit, while two other identical resistances R_3 and R_4 complete the bridge. A definite electric current flows through the bridge, heating the spirals, which in turn lose heat, through the gases surrounding them, to the walls of the cells. A standard gas—normal air—is trapped in cell A, which is sealed. The air of the room diffuses into cell B continuously and the change in its thermal conductivity due to the trace of hydrogen causes spiral R_2 to vary in temperature and, therefore, in resistance compared with spiral R_1. This unbalances the bridge producing a deflection in galvanometer G and this deflection is a measure of the change in thermal conductivity of the air, and therefore, of the concentration of the hydrogen producing that change. The actual instrument used gave a deflection of approximately 1 in. on the galvanometer scale for a change in concentration of 0·1%.

Development of the Method.

With a gas of the nature of hydrogen care must be taken to ensure that the concentration never reaches the explosive limit of 9%. In these experiments the maximum concentration employed was 0·2%. Other gases could be

[1] Report of the Building Research Board for the year 1927, p. 102.

[2] Dufton, A. F., and Marley, W. G. *Journ. of Inst. of Heating and Ventilating Engineers*, 1934, Vol. I., pt. 12, p. 645.

[3] Shakespear and Daynes. *Proc. Roy. Soc.*, 1920, Vol. A. 97, p. 273.

used, notably carbon dioxide, but hydrogen is fifteen times as effective and diffuses five times as fast.

The concentration of hydrogen tends to be greater near the ceiling. Experiments have shown that when the gas was simply released from a cylinder the subsequent concentration at floor level was about 70% of that at ceiling level. This proportion remained sensibly constant as the amount of hydrogen decreased (fig. 2) and, consequently,

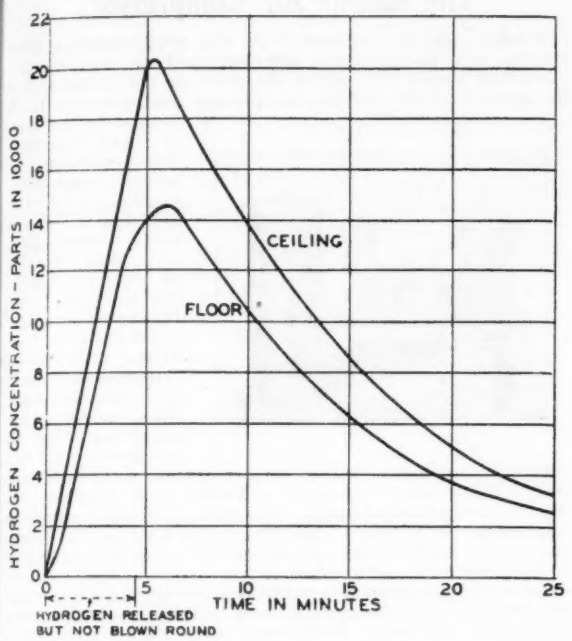


Fig. 2.—Hydrogen Concentration Curves.

the measured rate of ventilation is independent of the height of the katharometer above the floor. With such a gradient of concentration, however, the amount of hydrogen in the room would decrease more rapidly if the room were ventilated by extracting air near the ceiling than if the air were extracted near the floor, and a different figure would thus be obtained for the rate of air change. The hydrogen was therefore released into the horizontal air stream from an electric fan, which was run only while the gas was being admitted. A much more uniform concentration was obtained in this way and the measured rate of air change was reasonably independent of the height of the exit.

The Accuracy of the Method.

In order that the possibilities of the method could be readily explored, a fan was arranged to extract air from the room and deliver it to the outside through a duct. With such an arrangement all other apertures became inlets and the air flow could be computed from the pressure drop across an orifice plate in the duct. In the following table a comparison is shown between the rate of air change so calculated and that measured by the present method, with various sets of conditions.

Experiment No.	Air Changes per Hour from Orifice Plate Method.	Air Changes per Hour from Hydrogen Method.	Suction Point of Fan.	Remarks.
1	7·0	6·2	Floor	No circulating fan while hydrogen was admitted
2	7·0	8·1	Ceiling	
3	7·5	7·0	Floor	Hydrogen blown round room with fan
4	7·5	7·5	Ceiling	
5	7·7	8·0	Floor	Ditto. Air-brick ventilator open
6	7·7	7·5	Ceiling	
7	4·0	4·1	Floor	Comparison at lower rate

In these experiments the air was removed from the room at one point, situated near the floor or near the ceiling; the conditions were consequently more stringent than would be encountered in practice and the good agreement in the results of experiments 3 to 7 is regarded as highly satisfactory.

When a room is occupied, the concentrations of carbon dioxide and water vapour increase and both these substances affect the katharometer slightly. In order to minimize errors due to these changing concentrations the number of persons in the room was kept constant during and immediately prior to an experiment.

Experimental Procedure and Calculation of Results.

In the conduct of an experiment the katharometer is placed as central as possible in the room and an electric fan arranged to circulate air at floor level. Hydrogen is admitted to the air stream of the fan till the katharometer indicates a concentration of 0·2%. The fan is switched off and the katharometer read every minute for some twenty minutes. The readings are plotted on semi-logarithmic graph paper and a straight line drawn through them.

If a room be ventilated at a constant rate the amount of original air decreases exponentially. When a volume of air equal to p times the volume of the room has been introduced, that is after p air changes, the volume of original air remaining is equal to e^{-p} times the original volume, thus:

p	0	½	1	2	3	4
Volume of original air, %	100	60·7	36·8	13·5	5·0	1·8

From the graph of the observations of hydrogen concentration it is possible to read the number of minutes taken for the concentration to fall to 36·8% of its value at any time; this is the time of one air change.

Notes on the Operation of Glover-West Vertical Retorts

A New Instruction Book

Reviewed by J. G. King, Ph.D., B.Sc., A.R.T.C., F.I.C., Chief Chemist, Fuel Research Station, Greenwich

This volume is a new and up-to-date version of the original instruction book issued by West's Gas Improvement Company, Ltd., of Manchester. The last edition of the instruction book was published as long ago as 1924, but alterations in technique have been covered by papers appearing in *West's Gas*, the Company's own monthly journal.

The new "Notes" form an attractive volume of 71 pages, well printed in a clear style, and with over 20 explanatory illustrations and diagrams. It is divided into natural sections dealing with the different groups of operations: (1) Gas Producer, (2) Drying-out and Heating-up; (3) Carbonization, and so on; and it is an easy matter for the reader to find the information which he may require.

The value of clear-cut instructions of this type must be very great, not only to the Station Engineer, but to the shift engineer or foreman in whose immediate care the carbonizing plant rests. The comprehensive character of the notes makes it impossible to envisage an emergency for which they do not provide advice as to the best action. The section on maintenance and repairs contains many valuable hints whose strict observance would help to prolong the life of a setting. Attention is specially drawn to the expansion change-points which occur in silica brick at different temperatures. Proper control of the heating-up of a setting is a large factor in reducing subsequent repairs. The last chapter gives instructions for the operation of built-in producers on coke breeze. It is recommended that certain producers be segregated to burn breeze only (freed from dust) and that these be operated with a pressure of two to three tenths of an inch of water below the grate.

Where necessary, reference is made to published papers which the reader should consult. An interesting feature of each chapter is the brief conclusion with which it is rounded off. These are all very much to the point, and some could serve as axioms in connection with subject matter of the chapter.

Altogether, this book is one which no Gas Engineer operating a Glover-West retort should be without, and which should also provide much that is useful and interesting to those working upon other systems.

Notes on Plant and Processes

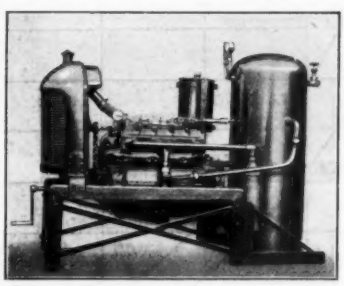
A New Sink Water Heater

A new sink gas water heater which supplies not only hot but boiling water has been placed on the market by Thermal Appliances Limited. The new appliance is operated by simply turning the controlling lever to "Steam," and after a few seconds to "Boiling," when, it is claimed, more than 3 pints of boiling water per minute can be obtained, and an unlimited supply of boiling water is at disposal at any time. Further, the boiling water delivered by the "TA" Geyser is fresh from the main, and it is therefore specially advantageous, for instance, for making tea, &c. The new "TA" Geyser has a special water deficiency valve, slow-ignition device, and mixing valves. The body is hard soldered. The finish is porcelain enamel and chromium.

The appliance is designed not only for household purposes, fixed in the kitchen over the sink to supply hot, cold, and boiling water whenever required, but also as suitable for tea and coffee shops, hotels, boarding houses, restaurants, &c., for the main purpose of making tea. The makers claim that, in addition to attractive appearance, the scientific construction and British workmanship combined with the finest materials guarantee trouble-free operation and long life, and moreover the initial outlay and running costs are surprisingly low. Even in hard water districts, they inform us, the boiler has proved most successful. Running tests conducted with water of about 15° of hardness showed that, after having supplied sufficient boiling water for making about 100,000 cups of tea, the geyser still operated satisfactorily, but it appeared advisable to have the outflow pipe within the body cleaned, which however is a simple matter and does not necessitate dismantling the apparatus.

The Raemir Air Compressor

Readers will be interested in the accompanying illustration of a petrol-driven self-contained air compressor—marketed under the name Raemir—so constructed that the motive power and the compressor are in one unit. It is exactly the same as any ordinary four-cylinder internal combustion engine, with two cylinders firing and two compressing air, thus making an extremely light and portable unit. In the case of the electrically or belt-driven models all cylinders are used to compress air. All models are fitted with an air purifier and an automatic unloader, which in the case of a petrol-driven unit both regulates the air pressure and controls the engine speed simultaneously, the whole unit being simple in construction and design, and thus easily worked. Different models are made to suit all requirements in all sizes, and designs from an output of 10 c.ft. to 100 c.ft., and at pressures varying from 20 lbs. to 200 lbs. per sq. in. These compressors are marketed by Raemir Air Compressors, Ltd., Nunbrook, Mirfield, Yorkshire, who claim that low-purchase price is accompanied by economical running costs.



Gas Undertakings' Results for 1934

Cardiff.

The Directors of the Cardiff Gas-Light and Coke Company present a report for the year ended Dec. 31, 1934, which states that an interim dividend to June 30 last having been paid on the consolidated ordinary stock at the rate of 6% per annum, and on the preference stock at the rate of 4½% per annum, the Directors recommend payment of a final dividend for the year on these stocks at the same rates less income-tax. Sales of gas to private consumers show a reduction as compared with the previous year of 207,560 therms.

Durham.

The profit and loss account of the City of Durham Gas Company shows an available balance of £12,551 (after deducting interim dividend), and the Directors recommend that a dividend for the half-year ended Dec. 31, 1934, of 5% on the original capital and 3½% on the additional capital be paid (less income-tax). The Directors record with regret the death of Mr. John George Burrell, who had been a Director of this Company for nearly ten years. Mr. Joseph Henry Armory has been appointed to fill the vacancy on the Board.

Ipswich.

The Directors of the Ipswich Gas Light Company submit accounts for the year ended Dec. 31, 1934, showing that, after payment of the interim dividend at the rate of £6 10s.% per annum and providing for interest and other charges, there is an available balance of £30,552. The Directors recommend the payment of the following dividends in respect of the December half-year—viz., at the rate of £6 10s.% per annum on the consolidated stock; and at the rate of £5% per annum on the 5% preference stock, which will absorb the sum of £7,594, leaving a balance to carry forward of £22,958. There was an increase of 32 million c.ft. (3·77%) in the quantity of gas sold.

Newmarket.

The report of the Directors of the Newmarket Gas Company for the year ended Dec. 31, 1934, states that the balance brought forward from last year is £9,323, less debenture interest paid for the year 1934, leaving £9,161. The profit earned during the year 1934 is £5,217, making a balance at the credit of profit and loss account of £14,378. The Directors recommend that out of this amount a dividend be paid at the rate of 8¾% for the year 1934 upon the £65,000 original consolidated stock of the Company, less income-tax 4s. 6d. in the £, which will leave to be carried to next year's account the sum of £9,970. Mr. J. H. Troughton retired at the end of the year from the position of Manager and Secretary to the Company, which he had occupied for 45 years, and has served the Company altogether 53 years. Mr. H. H. Redwood has been appointed his successor.

Newport (Mon.).

The Directors' report of the Newport (Mon.) Gas Company for the year ended Dec. 31, 1934, states that an interim dividend at the statutory rate of 5% per annum on the consolidated stock of the Company, for the half-year ended June 30, 1934, having been paid, it is now recommended that a final dividend at the same rate be declared for the half-year ended Dec. 31, 1934. Sales of gas show a slight falling off as compared with the previous year. The Directors record with regret the death of their colleague, Mr. George Geen, who had been a member of the Board for 34 years, and its Chairman since 1920.

Penistone.

The gas sold by the Penistone and District Gas Company has been 109,026 therms, compared with 106,229 therms in 1933, an increase of 2,797 therms, or 2·64%. The profits for the year amount to £1,009, which, with the balance brought forward from the previous year (£232), makes a total of £1,241. From this amount £24 has been carried to reserved fund, £10 paid (less tax) for debenture interest, and dividend paid or payable on preference shares (less tax) of £302. An interim dividend was paid on the ordinary shares for the June half-year at the rate of 7% per annum, which, less tax, amounted to £271. From the balance remaining (£632) the Directors recommend that a dividend be paid for the December half-year at the rate of 7% per annum, which, less tax, will absorb £271, and leave £360 to be carried forward. During the year the final instalment of the debenture of £8,250 created in 1922 was repaid to the debenture holders. The reserved fund has been increased to £3,000 by the allocation of £24 already referred to. As provision for possible reconstruction of works in the future, the amount authorized by Statute of £165 has been placed to special purposes fund, bringing the total to £1,485.

Sedgley.

The accounts of the Sedgley Urban District Council for the past year show a profit on their Gas Undertaking of £5,276, out of which loan charges of £3,095 have to be met.

Standardization and Quality Control

by
S. F. DUNKLEY, O.B.E.

Continued from p. 258 of last week's "JOURNAL," we publish the remainder of the Paper read by Mr. S. F. Dunkley, O.B.E., M.I.Mech.E., Officer in Charge of Stores Testing, Gas Light and Coke Company, before the London and Southern District Junior Gas Association on Jan. 25.

SECTION II.—QUALITY CONTROL.

Introduction.

Standards and specifications in themselves tend towards a more satisfactory and consistent quality; but in spite of this there will remain many products of poor quality resulting from accidental manufacturing error, the human element, inexperience and careless work, or definite unscrupulous trading.

Competitive buying and selling tends to reduce not only prices but also quality unless safeguards are applied, and there is always a large section of the public which is more attracted by cheapness and cut prices than by real value. However complete a specification may be, the need of inspection, with a view to controlling quality, will still remain. The need for some control is obvious from our everyday experience in the purchase of ordinary commodities, and some form of safeguard seems desirable. The public is beginning to expect it, particularly in the case of the more expensive types of commodities, and manufacturers often in their own interests, find it necessary to issue a guarantee of period performance or quality.

The small buyer of a large variety of articles is, unfortunately, always in a less favourable position than the large buyer. He cannot be expected to have the expert knowledge required for satisfactory inspection nor would the regular employment of a trained staff be economical. He has, therefore, to rely largely on suppliers of repute, on guarantee marks and certificates, or to contract with testing specialists, and cannot afford to take the same advantage of competitive buying as the large buyer with a ready and trained inspection staff behind him.

In Germany the National Institute for the Testing of Materials, Berlin, has a specially low range of charges, such as to make it possible for small business men and craftsmen to obtain reports on materials.

Attention has several times recently been called in the Technical Press of other and competitive industries, to the dangers of the very cheap and inferior apparatus and fittings, with a very small margin of safety, which are now being placed on the market, and some form of "Proving House" for the goods has been suggested. The suggestion, though by no means new and involving difficulties, would appear to be a very worthy one, and should appeal to industry as it would seem in the interests of all concerned that the use of some National Mark or Industry Mark of guarantee under suitable control should be adopted whenever possible. It is, however, of the utmost importance that a Proving House should only operate to approve for conformity to a published specification. Approval on the basis of opinion or undefined tests may lead to considerable difficulty.

Specifications are often drawn up with as little reference as possible to details of manufacture in order to give wide latitude for improvement in design or quality. In these cases it would seem particularly desirable in justice to the producers working faithfully to the specifications and to those responsible for their preparation, that the tests laid down be regularly and strictly applied. It is only in this way that general improvement can be expected.

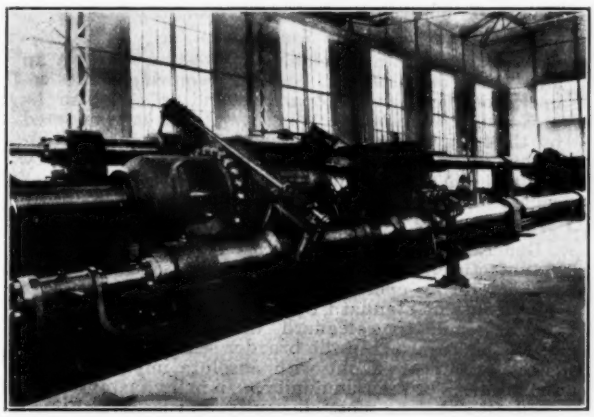
Value to Consumer.

Good quality invariably gives better service and longer life, but no article can be correctly judged as to price without a knowledge of its behaviour in service. On the other hand, competition to-day is largely directed at price rather than quality since low initial cost is always an attraction and quality more difficult to establish.

When no safeguard as to quality is available the public often pays heavily for an inferior article. Those with limited means have to depend on recommendation or purchase by trial and error, while those who can afford to demand a reasonable standard of quality, or find it a necessity, have to rely on higher prices and reputation for protection.

It is doubtful whether even a small percentage of the public when in a train or public conveyance, ever fully realize the extent to which their own safety depends on the quality of the materials used in the construction.

One often hears unsubstantiated claims of economy which entirely disregard service and are presumably based on the belief that saving on first cost is identical with ultimate saving. Cheap fuel burning appliances, in particular, provide many instances of false economy resulting from high fuel consumption and high maintenance cost.



The Largest Testing Machine in Europe at the National Institution for Testing Materials, Berlin—3,000,000 Kg. Compression and 1,500,000 Kg. Tension.

The purchase of a cheaper article for re-sale can also be an expensive experiment should the same percentage profit be added in calculating the selling price or if the quality happens to be inferior. The sales must be considerably increased to produce the same profit, and when the time comes for replacement, loss of confidence may be encountered.

To the conscientious trader also the sale of inferior and unsatisfactory goods must be a great embarrassment.

Division of Responsibility.

The real problem of controlling the quality of commodities sold in the open market lies in deciding:

(*a*) On whom the responsibility shall rest.
(*b*) How the cost shall be borne.
(*c*) How the supervision shall be applied geographically.
(*d*) The application of penalties to safeguard the public.

At the present time it is possible to classify responsibility and methods of inspection in the general engineering world under six broad headings:

(i.) *Government Departments, Municipalities, Railway Companies, &c.*

These Departments, owing to their widely differing requirements and the variety of industries with which contact is made, naturally use various methods of inspection and have very varying requirements and tolerances in their specifications. While some may demand absolutely rigid fulfilment of their specifications, others may judge individual cases on their merits.

The degree of rigidity must clearly depend on the factor of safety required, and skill of staff. Many have their own permanent inspection staffs who are often highly specialized in their respective departments, and carry out inspection work in their laboratories, and at the manufacturers' works, or on erection sites. Generally speaking, inspection under this heading is severe and keen, well carried out, and without any doubt produces a high degree of quality, but sometimes results in high inspection costs due to over-rigid specifications. In many cases, as with large industrial concerns, the purchases of raw materials and accessories are inspected and tested on delivery before being placed into store.

(ii.) *Insurance Companies.*

It is obvious that in order to safeguard their interests, Insurance Companies must have a very efficient system of inspection. The work must be carried out with great care by highly skilled specialists and is generally done by the Companies' own inspectors or by contracting with outside specialists. This class of inspection, without any doubt, has raised reliability in all branches of engineering, particularly in boiler work, to a very high degree.

(iii.) *Consulting Engineers and Architects.*

This class of inspection is chiefly aimed at the safeguarding of reputation and is mostly carried out by representatives of the firms responsible for the particular work, or by reliance on works tests, although assistance is sometimes obtained by the employment of independent testing specialists. It applies more particularly to materials used in large buildings, bridgework, and other large engineering schemes.

From observation it would appear that there is scope for greater control in this direction.

(iv.) *Testing and Inspection Specialists.*

Contracting with specialists for testing work is an admirable and efficient method requiring close co-operation between the parties, and it can also be arranged on an economical basis. It is usually adopted by those having insufficient work to warrant the employment of special staffs. The system is also very valuable in settling disputes and as an independent source for check tests.

(v.) *Manufacturers.*

Generally speaking, the tests carried out by manufacturers to-day are chiefly to save expensive manufacturing operations being wasted, to satisfy requirements of Standard Specifications, for competitive reasons, and to safeguard their reputation. They cannot be regarded in the broader sense as control and check tests carried out with absolute impartiality in the interests of the community. In many instances the inspection is done most efficiently by specially trained staffs and/or by outside testing specialists, and in some instances special tests are carried out for and under supervision of the purchaser or his assistant.

(vi.) *Individual Purchaser.*

This class of inspection is the least effective and in the majority of cases can be only of a very casual and superficial nature unless the purchaser has a very intimate knowledge of the particular goods and is prepared to engage the necessary staff and purchase the necessary equipment. It is particularly for the merchant and small buyer that some more easy and definite form of control is necessary.

The many industry associations are helping in raising the general standard of quality by their constant touch with manufacturers and users, by encouraging both research and testing in manufacturers' and their own laboratories, and by contact with the larger firms who employ specially trained inspection staffs to control the whole of their purchases and sales. Water authorities already demand, in their regulations and bye-laws, the use of definite qualities of materials and fittings on their areas of supply and some include clauses on the testing and identification of them. The Ministry of Health and the British Waterworks Association have done valuable work in this direction.

The electrical industry is able, under recently introduced regulations, to refuse to supply electricity to customers using, or proposing to use, equipment likely to be dangerous in use. The application of regulations such as these is always difficult for obvious reasons, and the more sensible way appears to be to attack the evil at its root by preventing the sale of the goods.

A very definite step forward, however, is that of the British Standards Institution in legalizing the use by approved manufacturers, under suitable conditions of guarantee, of a British Standard Specification Mark. This, when more widely used by producers and called for by users, will go a long way towards a general improvement in quality.

Some British and foreign industry associations have adopted, particularly in the case of appliances where safety is involved, a mark of approval. This mark indicates not only soundness in design of an initial sample, but also some measure of control of bulk supplies by inspection visits to works and periodical sample testing by the Associations. This again is a big step forward but gives only a limited measure of protection to the public.

If Industry Marks of approval were extended and the main responsibility for testing was placed on the manufacturer, as would seem reasonable, central control need not be costly or difficult. The manufacturers would carry out such tests as were mutually agreed at the time of the preparation of the standard specification, and area control could be effected by suitably arranged selection of random samples. The central control should be of an administrative character, as far as possible, to avoid any technical interference with the manufacturer or the unintentional leakage of confidential methods. It would appear that much help in this direction could be given by the various National and Industrial Research Associations in view of their close contact with the manufacturers and their products. Central control would still allow those demanding a greater measure of security or keen competitive prices complete freedom in the testing work carried out in their own laboratories, and provide a central body for appeal in the case of disputes.

The question continually asked and for which there is no definite answer is, "What happens to defective and rejected materials?" It must be admitted that in many cases these are returned to the market through other channels.

Technical Organization and Functions.

A system of this latter type, to be both reliable and at the same time an economical proposition, calls for constant and strict supervision backed by reliable testing costs. The permanent testing staff needs special training, versatility, a sense of anticipation, and a knowledge of statistical analysis. Semi-mass production methods must be adopted and the work reduced as far as possible to simple specialized routine tests.

With the large industrial concerns employing research and testing staffs, there must be the fullest co-operation between these two departments. The requirements of both as regards staff and equipment are sufficiently similar to make a complete separation both unwise and uneconomical. When special circumstances demand more exacting investigation, this can more economically be carried out by the research staff.

In industrial research one is seeking for better and more efficient methods and performance, whereas in testing one is looking for defects and possible failures. A knowledge of the requirements of the user should be the basis of all sound industrial research. It would therefore seem only reasonable to suggest that the most reliable facts as regards the possible manufacturing defects and failures in use should be in the hands of both the research and testing staffs, and that the fullest and closest co-operation should be maintained between them. This liaison establishes confidence and a sense of anticipation in the work of each.

The logical functions of a testing staff would therefore appear to be:

(*a*) To carry out in the most economical manner only such tests as are absolutely necessary to ensure safety, efficiency, and value for money.

(*b*) To gather together and tabulate suitably all recurring defects.

(*c*) To promote liaison between the user, the manufacturer, and the research worker with a view to improvements in quality and performance.

(*d*) To use the facts and statistics obtained, in the preparation and revision of standards and specifications.

(*e*) To provide the buying department with reliable statistics as to the quality of the materials handled.

Table 2 shows the organization as developed to meet the very wide needs of the Sales and Distribution Departments of the Gas Light and Coke Company. The Section is typically representative of centralized control carried out in the interests of the Company, but to the benefit of the manufacturer and consumer. Its responsibility starts with the interpretation of laboratory results and district requirements and the expression of them in the form of specifications.

Some 21,000 consignments of goods of all classes are handled each year, representing over 57,000 detailed

Photometric Testing Laboratory of a London Firm of Incandescent Lamp Manufacturers.

technical examinations of random samples as well as nearly 8,000,000 tests of a routine nature on individual items.

Tests at makers' works are also supervised and advice given as to the best type and layout of testing equipment for use. Apart from the value of the work in ensuring economy in purchase and safety and efficiency after installation, the cost is fully justified in the reduction of avoidable district complaints.

Technical Staff.

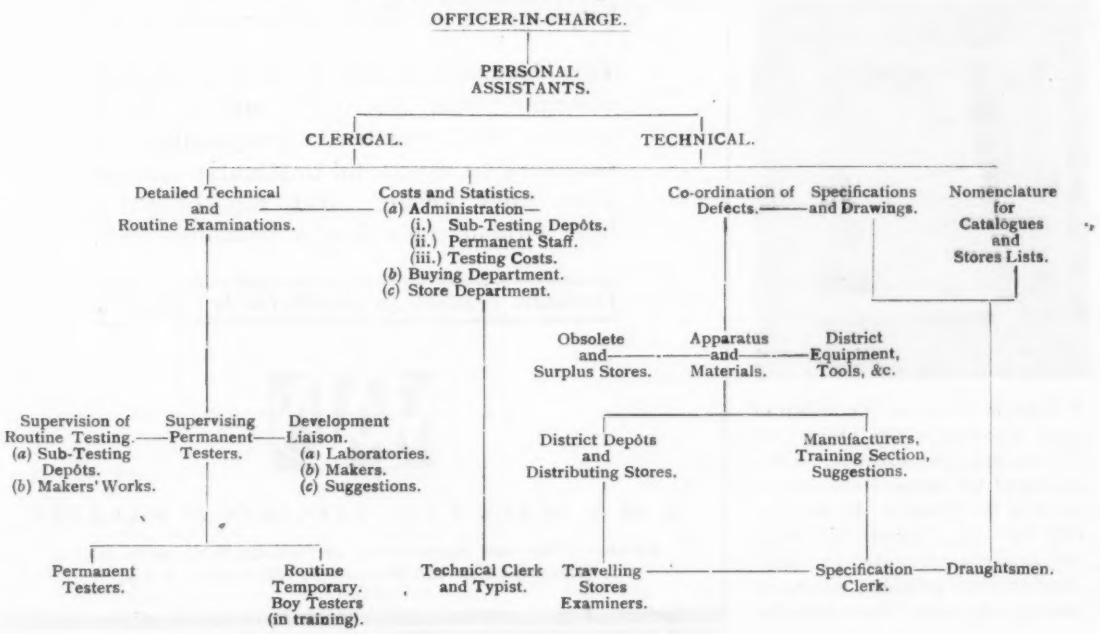
With the growth of quality control both by manufacturers and individual testing departments, the need for some definite form of training and professional qualification was felt, and in 1919 the Institution of Engineering Inspection was formed under the Presidency of Mr. A. H. Collinson, with a view to widening and stabilizing the practice of inspection in all branches of engineering and allied industries. This Institute, which is growing and rapidly extending its activities, welcomes and encourages collaboration in all matters of technique and personnel.

The difficulties in the application of tests are largely overcome to-day by the adoption in standards and specifications of the more simple and self-explanatory tests specially designed with a view to easy application.

The best educational basis for those specializing in this work is that provided by the syllabus for entry into the Institution of Mechanical Engineers which, while providing a good general engineering education, ensures a man taking additional subjects and obtaining a good knowledge of allied subjects such as metallurgy, electro-technics, physics and chemistry, or workshop organization and management, all necessary for the intelligent handling of commodities from a large variety of industries.

Keenness and a natural sense of anticipation, combined with a good memory and capacity for making quick sketches and notes and concise reports, are necessary to those specializing in this now recognized branch of industry, as well as a natural aptitude for correctly interpreting and anticipating facts considered in the preparation of standards and specifications. A man should be able to anticipate and differentiate between accidental manufacturing errors on the one hand and generally poor quality work on the other, and, after placing himself in the position

TABLE 2.—*Stores Testing Section.*



3 of the 5

SUSSEX
GAS COOKERS

In DAPPLE ENAMEL Finish

The SUSSEX Series comprises five sizes, each one specially designed to provide maximum oven working space—and alternative hotplates are available with certain sizes.

The Ovens are designed on the top-flue principle, with auxiliary outlets which provide that equalised temperature so necessary to successful automatic control. Thus they ensure good top browning heat without the aid of a browning shelf.

Literature available for distribution to consumers.

The Enamelled Oven Hangers or Grid Shelf Supports are of a new stamped design, flat in shape, with slots for the Grid Shelves, and are easily removable for cleaning. When in position in the oven they afford protection for the enamelled oven linings.

A notable feature in the design of these Cookers is the Oven Grid Shelves, which can, of course, be used in any of the runners or slots provided in the Hangers. In addition, each shelf may be used the reverse way in any runner to alter its height. These Shelves provide a variety of shelf spacings never before available.

MAIN

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of the manufacturer and consumer, to form an unbiased conclusion.

Division of Tests.

It is difficult to discuss in so short a time the various tests likely to be carried out by any individual testing department, and it was felt that analysis of the tests in frequently used specifications, accompanied by a film describing the more important and instructive, would be interesting. A convenient classification and grouping is as follows:

(1) *Mechanical Strength.*

Under this heading fall a number of general and very widely used strength tests, by means of which it is possible to test a solid for almost every mechanical weakness. The following are the most important:

(*a*) Tensile Test.
(*b*) Impact Test.
(*c*) Hardness Test.
(*d*) Bending Test.
(*e*) Torsion Test.
(*f*) Crushing and Transverse Tests.
(*g*) Alternating Stress Test.
(*h*) Drifting, Bulging, and Cupping Tests.
(*i*) Ram's Horn Test.

These tests, though requiring mechanical skill, are simple, easily carried out, and so well known as to warrant no further mention.

(2) *Physical Properties.*

Physical tests cover a very wide field and with mechanical tests are possibly the most frequently used. The more common ones include such tests as:

(*a*) Determination of specific gravity of liquids and solids.
(*b*) Accelerated ageing tests.
(*c*) Determination of viscosity of liquids.
(*d*) Filter tests for estimating the fineness of cement, paint ingredients, and similar materials.
(*e*) Volatility and drying tests.
(*f*) Comparison tests for quality of colour and intensity of staining power.
(*g*) Determination of stability of colour.
(*h*) Determination of calorific value of fuels.

The more general application is found in the handling of paints, varnishes, and oils.

(3) *Chemical Analysis.*

The chemical tests are almost invariably of an analytical nature, to determine accurately the composition of a material. They usually require to be done by a skilled chemist, and the cost therefore becomes a matter of importance.

Despite the introduction of many plastic and synthetic materials, metals and metallic alloys are still found to take premier place among the commodities of everyday life owing to their cheapness, durability, and general utility. Usually it is found sufficient and more economical to dispense with the more elaborate chemical tests, applying the microscopic, mechanical, or other tests, and resorting to chemical analysis only in the case of disputes, or materials which cannot be conveniently tested in any other manner, such as soaps, dyes, stainless steel, acids, disinfectants, &c.

(4) *Examination by Optical Methods.*

With the increased application of optics to industry there are now various widely used instruments which are essential equipment in any laboratory. These include the metallurgical microscope and the spectroscope for the checking and analysis of metals. Although often requiring specialized knowledge, these tests, once the necessary equipment has been obtained, are among the most satisfactory, convenient, and cheapest to apply. They are quick and in some instances give information that cannot be obtained by any other means, such as the degree of heat treatment or mechanical working a metal has received, the type and quality of weaving in fabrics, the presence of flaws in rubber, leather, and other materials.

The X-ray goes much further, enabling the detection of faults and flaws in thick sections of a material or welded joint, but at present the high cost of equipment prevents its more general adoption.

The optical projector is useful for analyzing screw threads, profiles, &c., and together with the travelling microscope, provides a convenient method of taking small and otherwise inaccessible measurements.

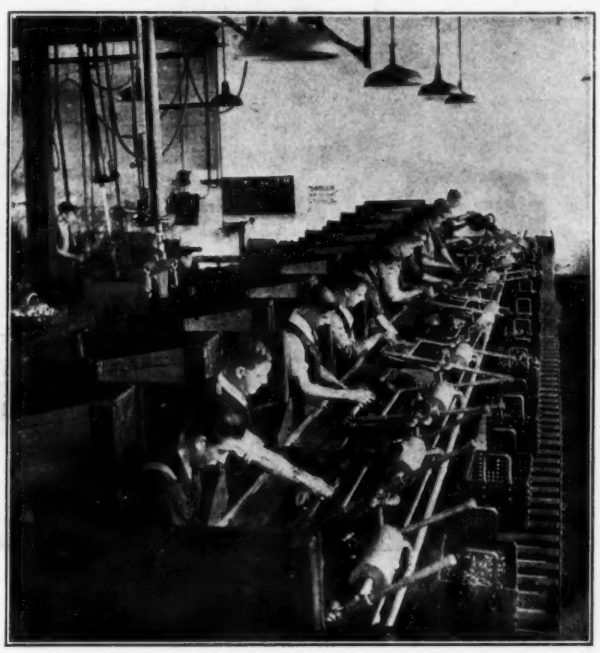
The comparison and calibration of light sources, such as incandescent gas mantles and electric lamps, can be effected economically and with reasonable accuracy by means of the photo-electric cell as well as by various other methods.

(5) *Pressure Testing.*

This can be divided into two classes:

(*a*) Hydraulic.
(*b*) Air.

The former is essentially a test for the mechanical strength of manufactured articles such as tanks, pipes, and containers having welded or sweated joints or which are subjected to high internal pressures, whereas the latter is solely a test for porosity or leakage at joints and is applied particularly to apparatus and fittings for holding or conveying petrol, gas, water, &c. This test is very searching and is usually applied by means of internal pressure, while the article is immersed in water.



A Battery of 12 Machines for the Mass Testing for Soundness of Malleable Cast-Iron Pipe Fittings.

(6) *Absorption and Permeability.*

It is extremely important to be able to estimate the porosity and absorbent qualities of material such as bricks, tiles, asbestos cement pipes, rubber, &c., in which the surfaces of the materials come into contact with liquids or gases. Absorption and permeability tests are applied in a variety of ways, but are usually very simple, merely involving the immersion of the substance in a liquid for a certain period and then a calculation of the increase in weight or bulk due to absorbed liquid.

(7) *Visual Comparison.*

This is the routine check test carried out by all factories and inspection departments for finish, flaws, cracks, blowholes, &c., and obvious departures from drawings and specifications.

(8) *Measurement.*

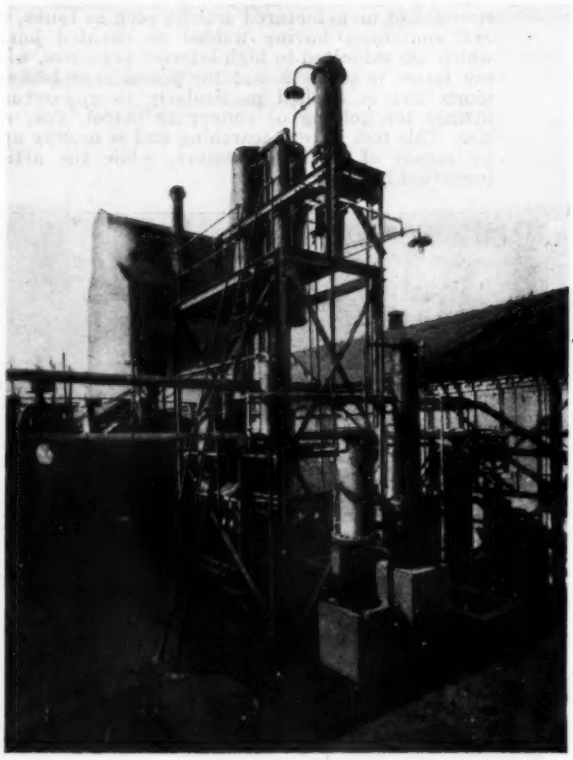
Tests in this section cover a very wide field and involve checking for size, squareness, angularity, flatness, straightness, weight, and also volume if capacity is specified.

Physical measurement can be divided into four distinct classes:

(*a*) General measurement by rule, &c., where exceptional accuracy is not required.
(*b*) Measurement to an accuracy of, say, 0·001 in. to 0·005 in., involving the use of gauges, such as screw gauges, plug gauges, snap gauges, or of micrometers, dial indicators, &c. This form of measurement would generally be associated with articles produced in quantities to specified limits.

BENZOLE PLANT

FOR LARGE & SMALL WORKS.



Thorncliffe type Benzole Recovery Plant at the Hampton Court Gas Co., Hampton Wick, Middlesex.

This plant will produce :—

1·85 galls. of benzole per ton of coal distilling 93°/₀ at 120° C.

or

2·25 galls. of benzole per ton of coal distilling 85°/₀ at 120° C.

Any required variation in product can be obtained by thumb screw adjustment.

(1) Any quality of benzole guaranteed from 70°/₀-95°/₀ at 120°C.

(2) Lowest possible water, steam and wash-oil consumption.

(3) Small ground space required.

(4) Existing gas washers can be adapted.

(5) Plants in operation can be inspected.

(6) Low capital cost.

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(*c*) Measurement to within 0·0001 in. to 0·0005 in. by means of one of the machines on the market for length or diameter measurements. These measurements are usually applicable to plug gauges, screw gauges, and length gauges. Measurements are also carried out to this order by means of slip gauges.

(*d*) The highest accuracy in mechanical measurement, namely, one-millionth of an inch, is obtained by optical means or with precision (spirit) levels.

Of these tests the first two are common to any factory or test shop; the third class, once the equipment is obtained, calls for patience and care rather than its exceptional skill, and is of use for checking gauges for articles where such accuracy is important. The fourth class calls for special equipment and is generally used by institutions such as the National Physical Laboratory for checking Standards.

Note: It should be clearly understood that an article made under class (*b*) above, could not be tested to the accuracy stated in class (*d*). For a flat piece of steel to be measured to millionths, its surface, flatness, and parallelism must be within a few millionths of an inch. Or to take another example, a roughly made screw could not be measured to an accuracy of one ten-thousandth of an inch because everywhere it was measured would give a different result. Accurate measurement not only depends upon having good equipment but on the finish and general accuracy of the article being measured.

(9) *Thermal Examination.*

Thermal Examination is usually required on materials which are likely to be heated when in use. Some of the more common tests include behaviour of paints at high temperatures, the melting point of pitch, solders, waxes, &c., thermal conductivity of fire-resisting materials, radiation tests on heating apparatus, testing of thermometers, Seger tests on firebricks, variation of resistance of wire before and after heating, the testing of materials for flues, hearths, &c., for incombustibility and non-inflammability. Naturally, certain thermal tests will require special and sometimes elaborate apparatus, but the majority of these tests are quite simple, demanding no special degree of skill and necessitating no expensive apparatus.

(10) *Electrical.*

The usual tests comprise the testing of insulation on wires and cables, the electric strength of pressboard, the rating tests of lamps, the testing of voltmeters, ammeters, wattmeters, the testing of small articles such as switches, bells, &c., the resistance of wires and life tests of batteries and accumulators. Most tests can be carried out without special equipment other than reliable voltmeters, ammeters, resistances, &c., and an instrument for measuring insulation. The quality of insulation on cables and underground pipes has become important and there are now many inexpensive and easily handled instruments in use for determining the resistance and presence of leaks in insulating coverings.

(11) *Endurance Life Tests.*

This type of test usually occupies some time, during which careful observations are made, the article frequently being tested to destruction. In some cases, such as rubber and enamel, it is possible to produce artificial ageing effects by heat treatment and oxidation and thus an article can be tested in a few days where normally it would occupy several months. In general, it is to find either the life output of an article, or to test it for a lengthy period and then inspect it for faults. Some fairly common tests include the life output of batteries, the life output of lamps (both electric and gas), the life output of files, hacksaws, or behaviour of painted surfaces over periods.

(12) *Practical Trade Tests.*

This form of testing is a quick and reliable guide to the quality or efficiency of an article. The object is to observe the behaviour of the article when it is functioning as it would do in use; it is applied either manually or by suitable mechanical means. Practically any article could be tested in this manner, but the tests are generally applied to cutting, driving, or gripping tools, such as drills, chisels, hammers, and wrenches, or polishes, paints, and other articles where it is difficult to obtain accurate results in any other manner.

(13) *Performance Tests.*

This classification applies more particularly to the testing of machines, apparatus, or assembled units designed to give a definite output or performance, rather than to the individual components that may comprise the whole, and is rather outside the scope of this paper. The tests on large plant are usually carried out at the manufacturers' works or after installation, under the supervision of an engineer inspector, and in the cases of the smaller industrial and domestic appliances under conditions applicable to the ordinary commodity.

Administrative Organization.

The cost of staff and equipment, however small, must be ultimately borne by the consumer. The merits of quality control are often challenged from this point of view, the question raised being whether it is not more economical to rely on a higher priced article of repute than pay money for testing an article just on the border line. If the ultimate cost is less, and equivalent or better value and service are obtained, there can be only one answer; but this is impossible to judge without reliable statistics, and it is for this reason that a knowledge of behaviour in service and testing costs become of such importance.

In deciding whether a test is necessary, or with what severity it is to be applied, the following must be considered:

(*a*) Whether safety in use is of prime importance.
(*b*) Whether the nature of the material, method of construction or manufacture, are such as to introduce the possibility of failure in service.
(*c*) The relationship between quality and performance.
(*d*) The cost of testing and effect on price.
(*e*) The value of the tests to competitive buying.

This information determines not only the nature of the test required, but also the number or percentage it is desirable to examine, and automatically groups the items under two main heads:

(*a*) *Individual Testing.*

Where the relationship between the quality, performance, safety, and/or cost is of such importance as to warrant 100% examination.

(*b*) *Sample Testing.*

Where the relationship between quality and performance is of less importance, or where value for money and competitive prices are the main considerations.

For economy the examinations may be carried out in a number of ways:

(*a*) A complete and detailed examination of the whole production or delivery.
(*b*) A complete and detailed examination of only one sample or of a percentage of samples selected at random, and in addition a less complete or minor examination on the remainder.
(*c*) A complete and detailed examination of one or a small percentage of samples only.
(*d*) A minor examination of the whole production or delivery.
(*e*) A minor examination of one or a percentage of samples only.

Where the examinations are made outside the factory, it is not always easy to decide the number of percentage of samples to be selected owing to the comparatively small number involved, or the irregular interval between small deliveries, and in these cases it is usual to select a suitable number of samples on a basis of:

(*a*) A percentage of samples from all consignments.
(*b*) A sample or samples from a given percentage of the consignments received.
(*c*) A percentage of the number of articles distributed.
(*d*) A periodical selection of samples.

It is generally found more economical and convenient from an administrative point of view and more technically reliable to adopt, whenever possible, either (*a*) or (*d*) methods or a combination of both.

A simple clerical system based preferably on individual job tickets is essential for the economic regulation of the method of selection of samples and the actual testing work. Information must be readily obtainable as to:

(*a*) The cost of the individual items handled.
(*b*) The quantity in circulation.
(*c*) The individual and collective testing costs on any one article.
(*d*) The nature and percentage of defects found.
(*e*) The variation in testing costs and percentage of defects between the various sources of supply.

These data, suitably prepared, enable the necessary adjustments to be made to the testing system so as to maintain it on an economic basis, and provides the Buying Department with all the information required for successful competitive buying.

Handling Inspection Results.

The inspection reports should contain in logical and sequential order exactly what the inspector finds in respect of each test applied and in order that he himself may feel some of the responsibility for the ultimate decision, should contain quite separately at the end, in the form of a summary:

(*a*) His conclusions and reasons.
(*b*) His recommendations and reasons for acceptance or otherwise.

One of the most difficult tasks in the handling of these results is to make a decision on a border line case. There is a fallacious belief that with any specification there can be only two courses of action, either acceptance or rejection. In view of manufacturing difficulties and of the need for economy, specifications cannot always be absolutely rigid, the "pious hope" clause containing such vague and indefinite phrases as "reasonably free from," or "approximately equal to," have to be used. In all commercial and mass produced articles there may be minute variations which constitute deviations from this standard without necessarily affecting the ultimate performance. The value of the article, the cost of transport in the event of rejection, the urgency of issue, and the value of amicable trading relations all have to be considered.

In order to avoid disputes and misunderstandings, the usual methods of handling these reports are:

(*a*) Acceptance as satisfactory.
(*b*) Acceptance with adverse comments.
(*c*) Acceptance at a reduced price.
(*d*) Rejection with reasons.

Treble transport charges and repacking of heavy and bulky articles can be very costly, and it is usual to give suppliers an opportunity of inspecting and deciding on the disposal of rejected consignments.

Co-ordination of Defects and Failures.

The knowledge of defects and of the cause of failure should be the means of their elimination, and there should be one central body for the examination and classification of the information.

Most failures fall under five definite classes:

(*a*) The use of materials of inferior quality or unsuitable nature.
(*b*) Poor mechanical or other treatment.
(*c*) Careless assembly.
(*d*) Unsatisfactory design.
(*e*) Faulty installation, use, or maintenance.

Defects of all classes can be very costly, particularly to those responsible for the installation and maintenance of a large variety of appliances. Unnecessary labour, material, and incidental costs are often difficult to detect without elaborate and costly systems, and encouragement should be given to all concerned to bring to notice even the simplest defect.

Some defects can only be detected after prolonged use, and in this direction a wealth of useful information can be obtained during the examination and classification of worn and obsolete articles, and this work, whenever possible, should be carried out in co-operation with the testing staff.

Whatever procedure is adopted for dealing with these, the system should be such that each case can be followed to finality and the routine or specification corrected as necessary.

[At the conclusion of the Paper a very interesting film was exhibited illustrating some of the methods of testing carried out by the Gas Light and Coke Company at Watson House.]

Discussion.

The PRESIDENT (Mr. F. C. Smith, Gas Light and Coke Company) said that they had had a paper of great interest and real value. Mr. Dunkley's experience of standardization and quality control enabled him to speak in an authoritative manner on these matters. The advantages and disadvantages of standardization had been discussed in a very frank manner, while the importance of standardization to national and international trade had been rightly emphasized. The film they had just witnessed had given them a very clear insight into the work which was being done by his Company in order to secure the most efficient service for their customers. The Gas Light and Coke Company, however, were not alone in the importance they attached to quality control, and in this connection he reminded them of the pioneer work and present activities of the South Metropolitan Gas Company and others. They as an Association were honoured on this occasion, said Mr. Smith, in having with them representatives of other engineering and technical bodies, and they were particularly gratified by the presence of Mr. Percy Good, Deputy Director of the British Standards Institution. They were also pleased to have with them many prominent manufacturers, to whom they extended, and to all their other visitors, a very hearty welcome, with the hope that they would give them the benefit of their experience in the course of the discussion. Continuing, Mr. Smith remarked that he had received a very nice letter from the President of the Institution of Gas Engineers, Mr. C. Valon Bennett, saying how sorry he was at not being present, at the same time extending his best wishes for a successful meeting and to the Association as a whole. They much appreciated, said Mr. Smith, this kind message of goodwill; during his term of office he had been constantly in the debt of his colleagues, and that night he felt increasingly so by reason of the tremendous amount of work that Mr. Dunkley had put into the preparation of this paper, while he would also like to join in thanking Mr. Austen and the photographers for their many hours' work in the production of the film. In conclusion, Mr. Smith referred to the presence of Mr. Stephen Lacey (Vice-President of the Institution of Gas Engineers and Controller of Gas Sales of the Gas Light and Coke Company), who had kindly promised to open the discussion for them.

The Danger in Standardization.

Mr. STEPHEN LACEY said that it was always a great pleasure to attend a meeting of a Junior Association; he could always be sure of listening to a very interesting paper—and generally a provocative one—in addition to meeting a large and enthusiastic audience. He was particularly glad to have the opportunity of opening the discussion on Mr. Dunkley's paper because he was very familiar with the excellent work he was doing for the Company they both served and for the Industry as a whole in putting into practice all the standardization and testing he had described to them. Mr. Lacey said that he attached particular importance to Mr. Dunkley's reference to the danger of standardizing everything and anything simply for the sake of standardization and in cases where there was no real need for it. Standardization, like most useful things, was a good servant but a bad master, and if it could not be kept within reasonable bounds it would do more harm than good. Not that there was any danger of that in the Gas Industry. There was a wide diversity of articles in general use; but they must "keep their feet on the floor." Standardizing of manufactured articles, he reminded them, was not in the least new; it certainly existed in the bronze age as well as in the middle ages, though it was the industrial revolution which was responsible for giving the first real boost to standardization. It was the inevitable corollary of mass production. Every manufacturer must produce his goods to a generally accepted standard specification, or he must establish provisional standards for himself. The original Ford car was the classic example of a manufacturer setting up his own standards. But Mr. Ford did not allow standardization to become his master; if he had he would be in the bankruptcy court now. When new models were introduced by competitive manufacturers, Ford had to start all over again.

More and more manufacturers of gas fittings, continued Mr. Lacey, were adopting standards and were producing good quality articles; and he emphasized that the best results were obtained by close co-operation between the manufacturers and the gas undertakings, who were their best customers. But he was not at all sure that such co-operation would lead to Mr. Dunkley's conclusion that "it was now generally recognized that the fuel itself was approaching perfection and that the task of the Gas Industry must now be to bring its appliances up to the same standard. This would be greatly facilitated by the adoption, whenever possible, of National Standards which would ensure durability, interchangeability, ease of maintenance, and reduction of cost." That, suggested Mr. Lacey, was a very challenging statement, and he would not take it up on that occasion because he was not at all confident that it would be desirable to go as far as that. He was doubtful whether it would be possible to get as far as that in their co-operation with the manufacturers. They wanted standardization of essential parts but not premature standardization which would hamper development. That applied particularly to finished gas appliances where style counted as in the case of motor-cars. The motor-car was a good example of standardization and its limits. He did not want the gas cooker to become so standardized that he would see the same appliance fifty years hence. The plug-in connector was developed at Watson House, and Mr. Dunkley was responsible for much of its development. It was produced to give facilities comparable with the electrical switch. There was now a B.S.I. specification for these connectors, and it was to be hoped that gas undertakings would see that they used that specification. This was an example where complete and final standardization of design was obviously desirable. The same applied to screw threads, so that all pipe running was easy and all carcassing free from bother.

He would now like to give an example where only partial standardization was desirable. They had a case of a specifi-

cation for gas meters of a partial nature with a view to bringing all manufacturers more or less into line and to speed up things a little so that all gas undertakings could buy the newest types of meters. One thing which was discovered when they were examining the fittings was that many undertakings continued to buy meters which had been obsolete for twenty years, and in that case it was not desirable—indeed, it was impracticable—to have a complete specification for this type of meter; so what was done was that the essential parts necessary to ensure a reasonable degree of interchangeability were standardized. He would conclude on the note of co-operation because the ideal at which they aimed was that all these wonderful tests which they had seen illustrated in the film should really be carried out by the manufacturer who knew his job and realized that testing was worth while from his own point of view. He thanked Mr. Dunkley for his interesting paper and said what a great pleasure it had been to attend that meeting.

A Challenging Document.

Mr. Percy Good (Deputy Director of the British Standards Institution) said that he would like to join in saying how much he had enjoyed the paper. He congratulated the Association if this was a sample of the papers they were able to digest in one evening. It was full of points worthy of a great deal of discussion, and Mr. Dunkley had thrown among them a very challenging document. From his own experience extending over many years of watching the work of various industries in the field of standardization he would like to make clear that the B.S.I. had reached a point where each industry in turn could become its own master in regard to standardization. While Mr. Dunkley implied that there were people who felt that the Gas Industry had, perhaps, not been as forward as others in the work, he should tell them that the Company which the Author represented had been a very active supporter of the B.S.I. for many years and of its funds, had seen new work over many fields, and had recognized the value of that work to the community, and had given of its men, service, and efforts for that purpose. The Institution had been able to secure the benefit of the assistance of men of the responsibility of Mr. Lacey to see if anything carried through was too premature or tended to restrict design unnecessarily. Everyone must admit that throughout the whole range of the Industry he controlled there was an unreasonable diversity of types and sizes which represented a colossal waste of money, stocks, and capital invested, in addition to the efforts to sell the commodity. It made selling very costly and difficult in many cases, and there was ample room for the elimination of much redundancy without eliminating selective details and designs. The best picture of the work of standardization could be obtained if they realized that from the very beginning of civilization the necessity for standardized weights and measures was recognized. While dealing with commodities which were bought by look or taste and required only the standardization of weight this was all that was necessary. But to-day the purchaser was buying apparatus and materials which could no longer be tested by taste or smell.

Ninety per cent. of the work of the B.S.I. was not related to measurement or to standardization of quality but rather to definitions of quality which did not necessarily imply one quality. That left to the individual the selection of the value he required. That obviously called for specifications and gave them a means of evaluating performance, and that was a very large undertaking. He would mention here, incidentally, that the coal burning people and those interested in coal burning appliances had been asked to set up a committee to prepare standards of evaluation and performance for solid fuel burning appliances. They had a much more difficult task before them than the gas and electrical industries; but they realized that they were going to lose business unless they did this.

The organization of the Gas Light and Coke Company, continued Mr. Good, had taught the manufacturers a great deal, and had been of great benefit. Accurate testing cheapened manufacture. The B.S.I. many years ago instituted a registered mark of quality, and in more recent times procedure had been worked out whereby licences were granted to manufacturers to mark goods in order to show conformity to standard specifications. A manufacturer who desired to have such a licence must have available—and maintain available—evidence that he was buying raw materials and testing them before he used them. He must have effective testing facilities himself, proper gauging, where gauging was required, and maintain such facilities for gauging and checking at proper intervals, and at each stage of the processes he must carry out such measuring, sampling, and testing that the finished article might be assumed to be right without further testing. On this principle the B.S.I. had based the use of the mark; and such procedure would greatly diminish the amount of work Mr. Dunkley's department had to undertake in the way of testing.

Elimination of the "Chancer."

Mr. Aspinal remarked that Mr. Dunkley had put many of them in possession of facts which had been entirely unknown to them in the past, and his paper would have a marked effect on the future of the engineering industries. In the early part of the paper Mr. Dunkley had dealt with "Origin and Aims." Standardization so far as it had gone at present had to a great extent eliminated the "chancer"—whose policy it had been to obtain orders at all costs. In regard to the schedule of the primary objects of Industrial Standardization, that relating to efficiency and safety in use was important, and in this connection he suggested that something might be done about the sale of machines which had to be properly safeguarded before they could be used. It was the practice of some manufacturers to sell machines unguarded, and the inexperienced or careless purchaser had to provide additional fittings at his own expense to make the machines comply with the Home Office Regulations in regard to safety. There were certain sections of manufacturers who still had individual specifications, and as one who had some experience of thermostatic control he could speak to the great help it had been to have standardization, not only of the quality of the gas, but also of pressure—which assisted very materially in simplifying the design of thermostats and automatic control valves for gas.

Dr. J. N. Long (Principal of the Westminster Technical Institute) observed that having decided to test an article one had to develop a technique of testing—which was a problem in itself—and Mr. Dunkley had done this in a simple way; and his paper was unique. As a member of the Institution of Mechanical Engineers, Dr. Long could say that they had never had to digest such a paper as this in one hour. It was a sad paper for anyone interested in the pride of craftsmanship, because it sounded its death knell. The moment one wanted a number of articles all the same it required a machine to produce them, and craftsmanship was gone. That was one of the penalties of progress. There was, however, a most undesirable element in wholesale standardization. It was a rather wonderful organization for testing at Watson House—and he spoke with some knowledge of the tube trade. But the work at Watson House was a fearful indictment of British manufacturers. Furthermore, why did they not see the names of the manufacturers more often on articles? Why could not such fittings be accepted with confidence without the necessity for this elaborate organization for testing? There appeared to be no evidence of this pride of manufacture in connection with many of the fittings they had had described to them. In conclusion, Dr. Long congratulated Mr. Dunkley on his suggestion for training for positions in the Gas Industry in respect of matters of a technical nature, such as testing for quality, and in this connection the syllabus of the Institution of Mechanical Engineers was one of the most valuable.

Mr. N. A. Birks (Abbott, Birks, & Co., Ltd.) also paid tribute to Mr. Dunkley's able analysis of every phase of standardization and quality control. As a trader he was familiar with some of the work carried on at Watson House; but he would be interested to have a description of the method whereby the testing department arrived at the conclusion that a certain design should become a standard article of equipment. In regard to tools, the question of weight was important when it was considered that the average gasfitter spent a large amount of his time carrying them about with him.

The Manufacturer's Viewpoint.

Mr. F. Lake (Radiation, Ltd.) observed that it was not unnatural, in view of the Author's position and experience in such a large clearing house of gas appliances, that the tendency of the paper was to direct one's sympathy towards what would appear to be a more ideal state of affairs from his own, or the Gas Company's, point of view. It occurred to Mr. Lake that in order to correct their perspective of the matter, a few words illustrating from his personal experience the domestic gas appliance manufacturer's viewpoint would not be out of place. He was not suggesting that the points had been overlooked in the paper; but they were, perhaps, rather lost among the tremendous amount of matter that the Author had put together.

In regard to standardization, curiously enough, he had chosen for his text the same extract from the paper as was taken by Mr. Lacey—namely, that "there is real danger in standardizing everything and anything simply for the sake of standardization and in cases where there is no real need for it." Perhaps he ought not to say this in the presence of Mr. Percy Good, but he once heard it said that the B.S.I. lived on, for, and by paper, the suggestion being that it churned out specifications in a machine-like manner without much regard to their practical utility. This was, perhaps, an extreme view. It might be argued that all interested parties, including manufacturers, were normally represented on the committee responsible for the recommendation of the standards; but unfortunately in many cases it so happened that the people most familiar with the real needs of the position could not afford the time necessary in committee work of this kind to present their case adequately, and the views of the less well-informed enthusiast won through.

Mr. Lake thought they would agree that anything which restricted the manufacturer's freedom of design restricted at the same time the consumer's freedom to exercise personal judgment and taste in his choice of appliance. And it must also be remembered that the manufacturer had his own problems in plenty—not always apparent to the purchaser. Suppose, for instance, a purchaser of gas cookers proposed to tie down a manufacturer, on the score of strength requirements, to a given analysis of cast iron. Now, it was very probable that the commonest cast iron was quite strong enough for this particular purpose, and there was no real argument for the imaginary specification in question. One of the manufacturer's own problems in this case might be enamelling; and to work his best quality enamel he required cast iron of a certain analysis of his own—possibly appreciably different from the specification in question. In order to conform to the specification, he might have to use a less satisfactory enamel; and as a control of the constructional quality of the cooker, the specification would have defeated its own purpose. As for standardization of design from the customer's point of view of minimizing the number of spare parts, &c., to be carried, curiously enough the manufac-

turer often found that his own efforts in this direction were to some extent nullified by requests from this and that gas undertaking for certain special features not in the regular line of goods. Experience in the preparation of instruction cards had brought this fact home. This involved quite an extension in the number of components the manufacturer had to make and carry. He was not adversely criticizing this state of affairs; but it did show that varying requirements and varying opinions as to what was best did exist and operate against a very close standardization of the details of apparatus.

Danger of Cheap Appliances.

Turning to quality control, said Mr. Lake, this was a matter on which all manufacturers of repute would be agreed in principle, in view of the obvious safeguards necessary in the use of gas as a fuel. The availability of cheap gas appliances of inferior performance, besides being a bad advertisement for the Industry, might be a positive danger to the community. He was thinking in particular of combustion performance, upon which his own Company had always taken a very strong line. The reputation of well-known manufacturers had undoubtedly been built up very considerably on the performance of their apparatus, which was synonymous with control of quality. Such control, of course, necessarily cost money. In the section headed "Division of Responsibility," when dealing with the tests carried out by manufacturers, the Author expressed the opinion that "they cannot be regarded in the broader sense as control and check tests carried out with absolute impartiality in the interests of the community." From personal experience, Mr. Lake said that he could hardly agree with this generalization, having participated in extensive work necessary to get certain apparatus to conform to hygienic standards, which, in his exasperation, he was disposed at the time to consider extravagant requirements. But recognized standards of his Company's apparatus had to be met, these standards being set to give a very ample margin to cover possible variations in production. Such criteria were surely directly in the interests of the consumer and, of course, of the Industry as a whole. Admittedly, in the last analysis such control was in the interests of business; for it was only by giving the consumer the highest service that a manufacturer's reputation was built up. In conclusion, Mr. Lake joined with previous speakers in complimenting Mr. Dunkley on a very well thought out dissertation.

Mr. P. Sugg (Wm. Sugg & Co., Ltd.) referred to the point which had been stressed that the manufacturer should be responsible for the quality of his goods. They, as manufacturers, did feel that because a thing was produced by their company it must be reliable. There were still some who doubted whether an undertaking was entitled to set up such a department for testing apparatus. But it was, in his opinion, perfectly justified. Manufacturers could not afford to rest on their laurels merely because their names were on the articles. Mr. Lacey had stressed the need for co-operation; co-operation was of great value to the manufacturers, for they made something and tested it and regarded it as ideal; but they had to look to the experience of the vast body of inspectors and fitters who could alone be in a position to find fault with the article on the district. The manufacturers could not possibly obtain that information without co-operation with the people who dealt with district complaints from day to day.

Mr. Young referred to the difficulty occasioned when part of one's products went to firms who relied upon specifications, while others bought solely on price.

To Overcome Duplicity of Parts.

Mr. Baskerville observed that if standardization were more prominent to-day many difficulties with duplicity of parts would be overcome, and manufacturers would be able to carry more adequate stocks. Mr. Lacey had raised the point of manufacturers undertaking the testing, in which connection he had referred to the case of the motor-car. But here there was a very great difference, for any standardization or control of quality in the motor-car emanated from manufacturers who were in open competition, whereas in the Gas Industry the standard was set by the Industry, and competing manufacturers could only follow as closely as they could and not go ahead of the people who set the standards. All manufacturers were anxious to follow the testing methods employed to-day by gas undertakings, who had given much care and attention to requirements. However, when the manufacturer had a good deal of trouble in reducing his overhead costs, and when it was not sufficient merely to reduce the price, he could, nevertheless, maintain a high standard of test and quality in his goods, which would redound very much to the benefit of the Industry he was trying to serve.

Need for a Critical Attitude.

Mr. C. A. Masterman (Gas Light and Coke Company) said that, in contrast to the support given by the manufacturers to a policy of standardization and testing, he would emphasize the need for maintaining a critical attitude without which the policy was itself dangerous. Specifications were good servants but bad masters; rigid regimentation conflicted with their national tradition. Mr. Dunkley's reference to a standardization of terms in the Gas Industry appeared to him to be extravagant. It was a short step from terms to tongues and thus to an attempt to standardize the human individual. Comment from Mr. Dunkley on the results of the many American specifications for appliances would be of interest.

While it was necessary to emphasize the need for commonsense in connection with any standardization policy, there could be no doubt that the co-operation which such policy ensured between the buyer and seller must be of the utmost value. The contractor sometimes felt a specification to be a declaration of war on the part of the buyer and the adoption of a testing policy to be a form of guerrilla warfare. This was a complete misconception of the object of a specification, which should form a bond of union in that it told the seller precisely what was required and limited the buyer in what he could demand. The earlier speaker who protested that his firm had had imposed upon them unworkable specifications surely showed a complete misconception of the proper relations between buyer and seller, since no intelligent buyer would remain deaf to representations from the contractor where the specification did not conveniently meet the contractor's processes. Generally speaking, no specification could be considered satisfactory unless it had received the approval of, and had embodied the comments of, the suppliers who were to fulfil its requirements.

The type of goods required in the Gas Industry, continued Mr. Masterman, would usually be bought on the basis of sample, drawing, and specification, speaking of these three aspects in their apparent order of importance. The specification was in the nature of a commentary on such points as were left unexplained by sample and drawing, and suggested convenient tests to ensure that deliveries would be satisfactory. To ensure flexibility, the British Standards Institution invariably circulated specifications to potential suppliers for comment, and encouraged repeated revisions in order that they might be kept up-to-date. Stress had been laid by some speakers on the alarming appearance of the various testing machines shown in the film. These machines, however, were not weapons for the chastisement of the contractors, but constituted beacons in that the definite results of test formed the basis of co-operative endeavour between buyer and seller to the end that the latter could most easily and cheaply fulfil the requirements of the former.

Finally, Mr. Dunkley would appear to have stressed insufficiently the human factor throughout his paper. Specifications and drawings were useful supplementaries, but blind and unintelligent reliance on the written word was likely to be fatal. Unless discretion was used, rigid specifications interpreted on the assumption of hostility between buyer and seller might easily lead to testing costing more than actual manufacturing, while the cost of manufacturing itself would rise to impossible heights. The specification, said Mr. Masterman, should represent the agreed views of buyer and seller as to requirements. The interpretation of these views must in the end rest upon the discretion of qualified and responsible personnel, and it was upon this discretion and upon this personnel that the success or failure of the whole policy must ultimately rest.

A Standardizing Authority.

Mr. R. P. Wilson (of the Institution of Engineering Inspection) thought it would be almost correct to say that one subscribed to every one of the propositions put forward by Mr. Dunkley. In fact, one might almost go so far as to say that everybody who had any knowledge of any engineering industry must agree on general principles with his propositions. He thought, however, that there were one or two statements which did not go quite far enough and that therefore some confusion of mind had arisen. Mr. Dunkley had said: "There is a real danger in standardizing everything and anything simply for the sake of standardization." Mr. Wilson ventured to think that this danger to-day was much more imaginary than real. Just previously he (Mr. Dunkley) defined Standard Specifications as "Documents produced by a national body." Now if this definition was correct, it followed that standards must be set up by that national body and that that national body, acting as a standardizing authority, must be recognized as such. In fact, the expression "standard" implied that it was a recognized standard, and if it was recognized, and had been set up by a standard authority, that authority might be relied upon not to rush off into the realm of standardization for its own sake.

If he might venture a criticism on the general trend of the paper he would say that the Author did not sufficiently recognize the fact that standardization and inspection should go together. Inspection had no meaning in practice without a standard and the effect of a standard disappeared unless the work produced was inspected to that standard. He thought probably their President (Mr. F. C. Smith) might be aware of the fact that he was a humble member of a band of people who were obsessed with the importance of inspection; and it might be that this fact was in itself sufficient justification for his invitation to take part in this discussion. Mr. Wilson hoped that the Author would—on some other occasion—give his present audience the benefit of his wide knowledge on methods of inspection adopted by the Company which had been far-seeing enough to secure his services. Mr. Dunkley did, in fact, refer to inspection by optical methods, and he would like to supplement his remarks on this subject by referring to the fact that workshop inspection necessitated in nearly all cases the use of such things as micrometers, gap gauges, thread gauges, and even the humble foot rule. Most of these aids to inspection were subject to wear, and if their use was continued after the permissible amount of wear had taken place they naturally became a source of very considerable danger. It was not often realized that the installation of an optical gauge meant that all, or nearly all, master gauges could be dispensed with.

Isolation of Inspection Department.

He could not help thinking that there were advantages to be derived from isolating the inspection department from any and

every other. It was true that a design should never be finally settled without reference to the inspection department, but he felt strongly—as the result of some considerable experience—that in many cases advantages were to be derived from the complete isolation of the inspection department and a limitation of its duties to those of inspection and acceptance. The inspection department should have clearly laid down for its guidance the limits within which they might finally reject. It might be said that this was merely a question of permissible tolerances; but however carefully the tolerances were laid down it would always be found in practice that a good many articles which the Inspection Department would in the ordinary course of affairs reject were good and useful for their several purposes. In conclusion, he thanked the President for having invited him to this meeting, and also for calling the attention of the audience to the existence of the Institution of Engineering Inspection which he had the honour to represent.

The Author's Reply.

Mr. DUNKLEY, replying to the discussion, said how much he personally appreciated the great interest that had been shown in the subject, first, by the large attendance, and, secondly, by the discussion and the many letters that he had already received. He also much appreciated some of the things which had been said, and would like to take the opportunity of saying that he was in a very favoured position in having around him a large circle of able and helpful colleagues and friends, and a very efficient staff, and that it was largely to these that any credit should go. Mr. Dunkley said how very much he appreciated the attendance of Mr. Stephen Lacey, his Chief, and the kind things that he had said.

Several people had drawn his attention to the important question of the sale of second-hand apparatus, pointing out that he claimed as one of the advantages of standardization, better second-hand value, but had made no reference to the control of quality As many of the members knew, this was a question on which he had strong views; the sale of second-hand appliances by gas undertakings and manufacturers was under supervision, but he did feel that the question of the sale of out-of-date and possibly inefficient apparatus in the general second-hand shop, was to be deprecated. It had been suggested that simple hire tended to decrease the quantity of second-hand appliances offered for sale, but on the other hand there would always be a large number of people who preferred to purchase outright or to hire-purchase.

Another matter that had been raised was that of the cost of testing work. He thought it would be generally agreed that any expression in terms of £ s. d. could be very misleading unless each individual item was fully considered. He had specially called attention to the need of careful supervision in order to prevent testing costs getting out of scale, and some of the factors affecting the cost.

As regards the discussion, Mr. Dunkley felt that most of the speakers had been very lenient, and he assumed that they were in agreement with the general principles put forward, which, summarized, demanded the closest co-operation between producer, merchant, and user, in all matters in which they were mutually concerned. There was no doubt that judicious standardization was generally recognized as desirable, and quality control was a necessary part of standardization and should be carried out in the most friendly way possible. Many of the points raised by some speakers had been answered by others. Mr. Lacey had raised an important point on the paragraph where it was stated that the perfecting of appliances would be greatly facilitated by the adoption, whenever possible, of national standards. In this connection, Mr. Dunkley said he was referring to the standardization of commodities and small components which tended to build the whole, rather than complete standardization.

Mr. Masterman asked for comments on the results of the many American specifications for appliances. In this respect he felt that everyone would agree that the general appearance of the American cooker was very pleasing and in conformity with modern taste, and that it would not appear that standardization had in any way been harmful in this respect. He also thought that some of the specifications were phrased in rather broad terms with insufficient detail, and this in many instances had not led to the same high standard in workmanship and mechanical detail.

Dr. Long contended that it was a sad paper for anyone interested in the pride of craftsmanship, but he, the speaker, felt that the manufacturers of mass-produced articles generally would not be in agreement that the pride of manufacture had disappeared; indeed, it was largely due to a desire for consistent quality that the sales of testing equipment of all descriptions had increased so rapidly since the war.

Mr. N. A. Birks asked for information as to the procedure in adopting certain designs of tools and equipment. Briefly, it could be stated that before any article was adopted for general use it was first subjected to rigid tests by skilled practical men in the laboratory, and finally tested by selected men in the training section and on the district. It was most essential in a Company of the magnitude of the Gas Light and Coke Company that thorough tests should be made, and, in order to get reliable and unbiassed opinions, that in addition some lead should first be given as to the economics, and the difficulties that might be encountered. Mr. Dunkley also stated that, as Mr. Birks was possibly already aware, very great attention was paid, not only to the weight of individual tools, but to the number of tools and weight of the kit carried by the various classes of fitters.

Mr. Lake had referred to the statement that, generally speaking, tests carried out by manufacturers were not carried out with absolute impartiality in the interests of the community, and Mr. Dunkley said that he felt from his experience, and looking at it in the broadest possible way, the statement contained in his paper was a fact, particularly when regarded in the general sense rather than as applied to a particular item. His remarks were not directed to any one particular industry, but referred to general conditions as they existed to-day.

Mr. Young's point that manufacturers to-day who were definitely trying to sell reliable articles made to recognized standard specifications and were greatly embarrassed by the many who bought solely on price was a very real one, and constituted one of the strong arguments from the manufacturers' point of view in favour of the advantages of standards being more widely known. The adoption of national and industry marks of quality would help in this respect. Mr. Dunkley said that he assumed that in the reference of Mr. Wilson to the dispensing with master gauges by the installation of optical gauges, he was referring to the many forms of optical comparators and measuring microscopes at present on the market; and he quite agreed that this was an essential and necessary part of the equipment of a testing department of any size. He would be interested to hear Mr. Wilson's views on the advantages to be gained from isolating an inspection department, as, in his own opinion, it was fundamentally unsound and led to what could be observed every day in the staff becoming out-of-date and lacking in sense of anticipation. With a system run on the lines suggested there could be no question of collusion, and the department, within limits, should, in fairness to the manufacturer and buyer, be open to criticism at any time. He felt, also, that the inspection department should be closely linked with the buying department.

Scottish Juniors Visit Edinburgh

Inspection of Meter Works

On Jan. 26, some thirty members of the Scottish Junior Gas Association (Western District) visited the Edinburgh Works of Messrs. Thomas Glover & Co., Ltd., Gas Meter Manufacturers. These works have been designed to meet the requirements of a branch meter manufacturing establishment, which supplies all meters for their Scottish trade.

The works consist of a meter shop, including an assembling department, and sections for dealing with brass work, leather diaphragms, and testing. There is also a Government Testing Station in the works where the official stamp is fixed. Besides these are the paint shop, stores and despatch departments, with commodious offices for administration. A further interesting feature was the exhaust plant which carries off the fumes from the tinmen's stoves.

After the survey of the works the members were entertained at tea, after which Mr. A. W. Sharman, Chief Chemist of Thomas Glover & Co., gave a talk on "The Working of a Dry Gas Meter," illustrated by films.

The particular purpose of the talk was to consider the details involved in metering coal gas. To the every-day consumer this is accomplished by means of the dry gas meter, and it was to gain an insight into the principles governing this apparatus that the talk was confined.

A film was shown, first, dealing with the works of Messrs. Thomas Glover & Co., Ltd., in North London, and many of the processes used in the manufacture of meters were demonstrated. The works have an area of about 6 acres and can produce from 1,000 meters per week. It is adjoined by R. & A. Main's stove works, and the two works consume between 70 and 100 million c.ft. of gas per annum.

The works have been rebuilt during the past two years and many modern improvements incorporated. Every fire pot is exhausted to a main exhaust system and 50,000 c.ft. of warm and clean air is replaced per hour. A running commentary was given by Mr. D. Scott, of the Firm's experimental department, who pointed out all matters of interest.

The next film was a survey of the work done by the meter, particular attention being paid to the valve mechanism and the prepayment valve action. It started with a series of models demonstrating the progress of design during the past 91 years. The No. 1 meter made by the firm was shown, also their early prepayment meters, the former being dated 1844, and the latter 1894. An early two-coin meter and then the lights, standards, and finally the high-capacity meters.

The prepayment mechanism was then dealt with in the same manner, it being possible to see the coin enter the price changer and watch the effect of turning it in the drum. The drive back by means of the long spindle from the meter was then studied and many points affecting this part of the meter were explained. Finally, the question of testing in operation with differential gauges to show absorption and oscillation were dealt with.

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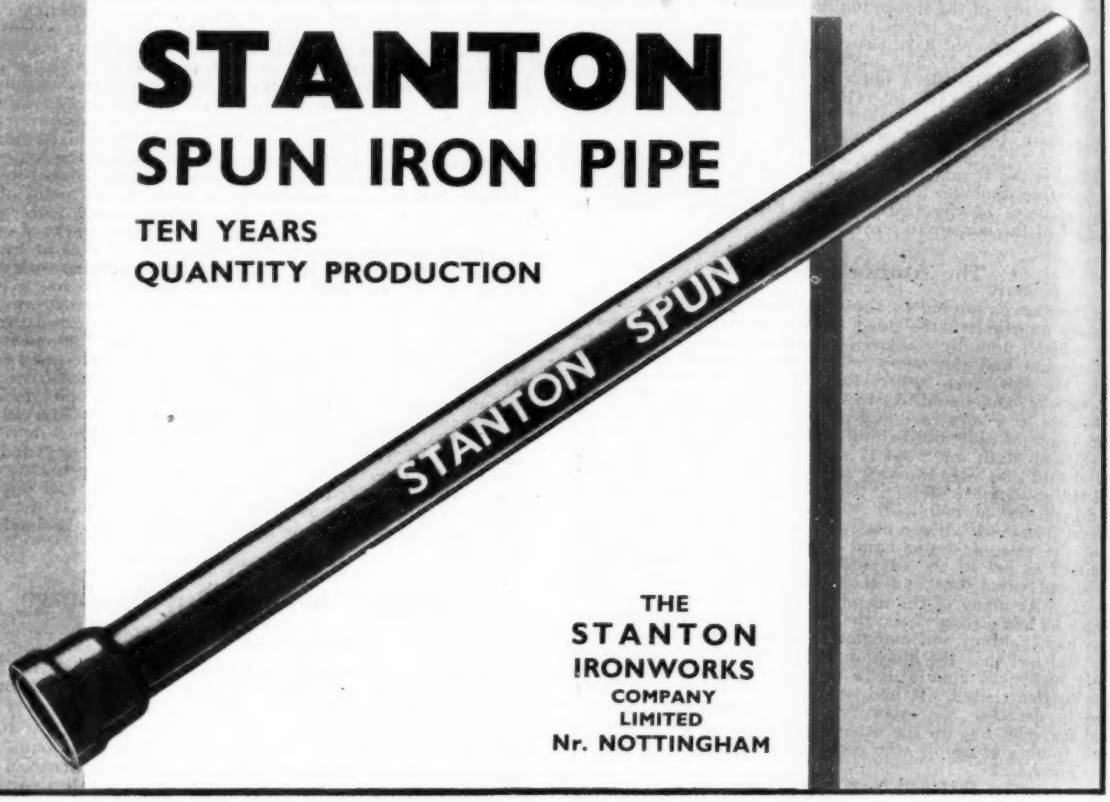

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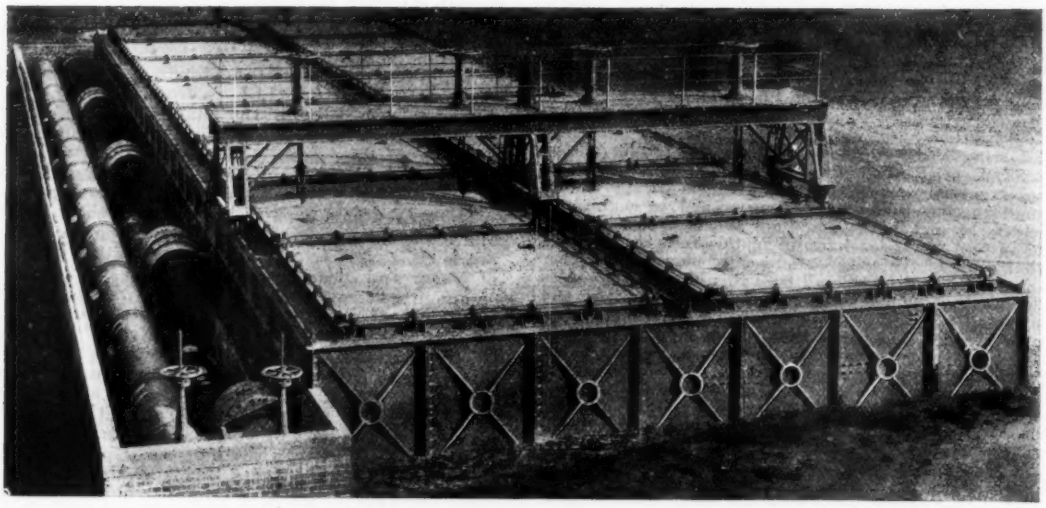

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share List, see later page)

The uncertainty as to how far-reaching would be the effects of commodity speculation led to dull conditions in most markets up to Thursday of last week, though during the last two days the outlook became brighter and prices began to recover, especially in the investment sections. The gilt-edged market, however, continued under a cloud owing to the failure of several recent important new issues, for during the past fortnight about £16,000,000 of stock has been left in the hands of underwriters, and this must be absorbed before the market reverts to normal conditions. It seems likely that corporations and others who are preparing conversion schemes with the laudable desire to bring down interest charges will in the future have to make their terms a little more generous.

The disturbing influences mentioned above had little, if any, effect on the Gas Market. The volume of business was normal, and prices on the whole were well maintained. The fears of some reduction in the South Suburban dividend, in common with the two Companies with which it is associated, proved unfounded, and after the announcement the stock changed hands at considerably higher prices though the quotation remained unchanged.

It is satisfactory to record that the Gas Light and Coke Company's issue of £2,500,000 3% debenture stock at 93½ was entirely successful. Allotment letters were posted on Friday last and dealings commenced on Monday. The Company's report and accounts for the past year, together with those of the South Metropolitan Company, are dealt with elsewhere in this issue.

Included among last week's final or half-yearly dividend announcements were the following: East Hull Gas, 2½%, making 5% for the year (unchanged); East Surrey Gas, a final dividend of 3% on the ordinary "B" shares, making 6% for the year (unchanged); South Suburban Gas, a final of 3%, making 6% for the year (unchanged); and Wandsworth and District Gas, a final dividend of 3½%, making 7% for the year, a rate which has been maintained since the consolidation of stocks in 1930. The last-named Company reported that the number of appliances sold during 1934 constituted a record.

Current Sales of Gas Products

The London Market for Tar Products.

LONDON, *Feb.* 4.

There are no changes to report in the prices of tar products, which are as follows:

Pitch, about 46s. per ton f.o.b.

Creosote, 5d. to 5½d.

Refined tar, 4d. to 4½d. per gallon in bulk at makers' works.

Pure toluole, 2s. 2d. to 2s. 3d.; pure benzole, 1s. 9d. to 1s. 10d.; 95/160 solvent naphtha, 1s. 7d.; and 90/160 pyridine, 6s. 3d. to 6s. 6d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Feb. 4.

The average prices of gas-works products during the week were: Gas-works tar, 21s. to 26s. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 45s.* Toluole, naked, North, 1s. 7d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 6¾d. to 6¾d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 4¾d. Heavy naphtha, North, 9¾d. to 10¾d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅜d. to 4½d.; low gravity, 4⅜d. to 4½d.; Scotland, 4⅜d. to 4½d. Heavy oils, in bulk, North, 4d. to 4¼d. Carbolic acid, 60's, 1s. 8d. to 1s. 9d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Feb.* 2.

Trading is on moderate lines, but prices of most products are steady. Creosote oil continues rather scarce.

Crude gas-works tar.—Actual value remains at 29s. to 31s. per ton *ex* works in bulk.

Pitch.—There is little movement, and no material alteration is expected to take place this shipping season. Export value is called 43s. to 44s. per ton f.o.b. Glasgow and, in the home market, round 42s. 6d. per ton is obtainable f.o.r. works, full truck loads.

Refined tar.—Makers are adopting a firmer attitude, and prices are not lower than 3d. to 3¼d. per gallon f.o.r. naked.

Creosote oil is still scarce, particularly for prompt delivery. Prices, however, show no alteration on the week's trading.

B.E.S.A. Specification, 4½d. to 4⅝d. per gallon; low gravity, 4⅜d. to 5d. per gallon; and neutral oil, 4½d. to 4⅝d. per gallon; all f.o.r. in bulk.

Cresylic acid.—Quotations are steady, but orders are not too plentiful meantime. Pale, 97/99%, 1s. 3d. to 1s. 4d. per gallon; dark, 97/99%, 1s. 1d. to 1s. 2d. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon; all *ex* works.

Crude naphtha.—Production is small, and value is 4d. to 4½d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 heavy is 9d. to 10d. per gallon.

Motor benzole commands 1s. 3d. to 1s. 4d. per gallon for reasonable quantities.

Pyridine.—90/160 grade is 5s. 6d. to 6s. per gallon, and 90/140 grade 6s. to 6s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9	to	0	9½	per gallon at works
Motor ,,	1	3½	,,	1	4	,, ,, ,,
90% ,,	1	4	,,	1	4½	,, ,, ,,
Pure ,,	1	7½	,,	1	8	,, ,, ,,

Overseas Opportunities

Singapore.

H.M. Trade Commissioner at Singapore reports that the Municipality of Singapore is calling for tenders, to be presented in London or Singapore by Feb. 14, 1935, for the supply of 1,500 ft. of ½ in., 1,000 ft. of ¾ in., and 1,500 ft. of 1 in. high-pressure copper tubes. (Ref. G.Y. 14,710.)

Johannesburg.

H.M. Trade Commissioner at Johannesburg reports that the Union Tender and Supplies Board is calling for tenders, to be presented in Pretoria by March 1, 1935, for the supply of 12,439 cast-iron spigot and socket pipes, 3¼ in. by 9 ft. (Ref. G.Y. 14,703.)

Contracts Advertised To-Day

Carbonizing Plant, &c.
Loughborough Gas Department. [p. 330.]

Coal.
Milford Haven Urban District Council. [p. 330.]

Coke Handling Plant.
Plymouth Gas Department. [p. 330.]

Exhauster, Scrubber, Condensers, &c.
Loughborough Gas Department. [p. 330.]

Gasholder Removal and Replacement.
Chesterfield Gas Department. [p. 330.]

Lamp Columns and Lanterns.
Malvern Urban District Council. [p. 330.]

Oxide Handling Plant, &c.
Loughborough Gas Department. [p. 330.]

Pipes and Specials.
Loughborough Gas Department. [p. 330.]
Milford Haven Gas and Water Department. [p. 330.]

Retorts.
New Mills Gas Department. [p. 330.]

Weighbridge.
Loughborough Gas Department. [p. 330.]

Trade Notes

Messrs. Peebles & Co., Ltd.

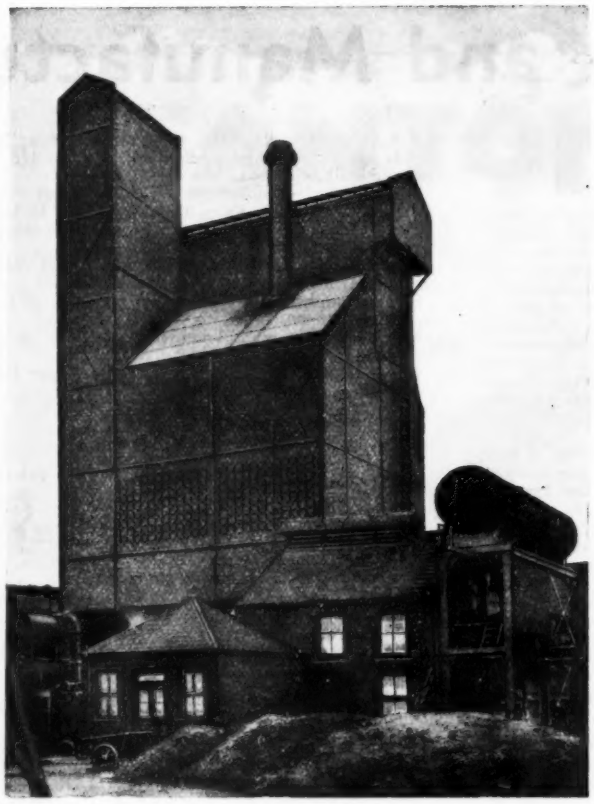
Messrs. Peebles & Co., Ltd., Gas Engineers, of Tay Works, Bonnington, Edinburgh, announce that the appointment of Mr. S. J. Sewell as their representative in the South of England has been terminated.

Specialities for the Gas Industry.

Messrs. Rotherham & Sons, Ltd., Watch Manufacturers and Engineers, Coventry, have sent us a copy of their new catalogue. This firm make all kinds of specialities for the Gas Industry as well as for automobile, aero, electrical, and engineering trades.

Materials for Modern Purifiers.

We have received from the British Gas Purifying Materials Company, Ltd., 99, London Road, Leicester, a booklet giving information concerning their various qualities of natural British purifying material, specially lightened "Vylsel" oxide, rich hydrated oxide, and North-East Dutch bog ore.



LEVEN, SCOTLAND

This installation of 12 Glover-West vertical retorts with a nominal total daily capacity of 720,000 cubic feet was built at the works of the Buckhaven and Leven Gas Commissioners in 1926. An order was recently received from the Commissioners for a second installation, on which work is now proceeding. This unit will comprise a further four retorts, bringing up the nominal daily capacity of the plant to 960,000 cubic feet.

Another repeat order for

GLOVER-WEST VERTICAL RETORTS

IN Scotland there are now 27 gasworks equipped with Glover-West vertical retorts. At twelve of these works extensions have been or are being added. The Montrose Gas Company, Ltd., the Falkirk Corporation Gas Department and the Johnstone Corporation Gas Department are amongst the undertakings from whom repeat orders have recently been received.

Considerably more than 510 million cubic feet is the estimated total daily gas output of Glover-West vertical retort plant in the United Kingdom and in 20 countries overseas. The total number of retorts installed exceeds 10,000. Out of more than 230 of the world's gas undertakings now equipped with Glover-West vertical retorts, repeat orders for extensions have been received from no less than 150.

This Company continues to pursue a policy of constant effort towards the further advancement of modern gasworks practice. We are prepared at all times to co-operate with engineers and administrators to the full extent of the resources of our organization, in the common interest of gas progress.

GLOVER-WEST VERTICAL RETORTS . . . WESTVERTICAL CARBONIZING CHAMBERS . . . THE WEST LIP-BUCKET CONVEYOR WITH AUTOMATIC FORCED LUBRICATION . . . BELT AND PUSHPLATE CONVEYORS . . . ELEVATORS . . . COAL BREAKERS . . . COKE CUTTERS . . . WAGON TIPPLERS . . . SKIP HOISTS . . . TELPHER PLANT WASTE-HEAT RECOVERY AND BREEZE-BURNING EQUIPMENT

WEST'S CARBONIZING & FUEL-HANDLING SYSTEMS

WEST'S GAS IMPROVEMENT COMPANY, LTD.

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'Phone: HOLBORN 4108. 'Grams: "IMVERTRET, WESTCENT"

MANCHESTER - ALBION IRONWORKS, MILES PLATTING
'Phone: COLLYHURST 29 1. 'Grams: "STOKER, MANCHESTER"

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Feb. 1.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Sept 10	7	7	Alliance & Dublin Ord. ...	135—145	...	139½
374,000	,,	Dec. 17	4	4	Do. 4 p.c. Deb. ...	90—100	...	...
567,655	,,	Aug. 13	7	7	Barnet Ord. 7 p.c.	168—173	...	...
300,000	1	Oct. 8	1/9⅛	1/4⅛	Bombay, Ltd.	30/— 32/-	...	...
178,480	Stk.	Aug. 13	9½	9½	Bournemouth sliding scale	227—237	...	237
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	172—177	...	176
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	150—155	...	...
50,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb. ...	86—91	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	106—111	...	110½
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	130—135	...	...
357,900	,,	Aug. 13	7½	7½	Brighton, &c., 6 p.c. Con. ...	181—186	...	183—184
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	160—165	...	164—165
195,500	,,	,,	6	6	Do. 6 p.c. B. Pref.	145—150	...	...
1,487,500	,,	July 9	5	5	Bristol 5 p.c. max.	122—124*a*	...	...
120,420	,,	Dec. 17	4	4	Do. 1st 4 p.c. Deb. ...	102—104*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	102—104*a*	...	...
238,790	,,	,,	5	5	Do. 5 p.c. Deb.	122—124*a*	...	...
855,000	,,	Sept. 24	8	7	British Ord.	174—179	...	176
100,000	,,	Dec. 17	7	7	Do. 7 p.c. Pref.	160—165	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	97—102	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	111—116	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	Dec. 17	4½	4½	Do. 4½ p.c. Deb. ...	90—95	...	90—93
626,850	,,	Jan. 21	6	6	Cardiff Con. Ord.	133—138*	...	...
237,850	,,	Dec 17	5	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	July 23	6⅔	5	Chester 5 p.c. Ord.	113—118*b*	...	...
98,956	1	Sept. 24	2/-	2/-	Colombo, Ltd. Ord.	1⅛—1⅛	...	...
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref. ...	19/6 - 21/6	...	...
609,304	1	Sept. 24	/11 '48	/11 '48	Colonial Gas Assn. Ltd. Ord.	19/6 - 21/6	...	...
296,053	1	,,	1/3'30	1/3'30	Do. 8 p.c. Pref.	25/- - 27/-	...	...
1,775,005	Stk.	July 23	6⅔	5	Commercial Ord.	122—127	...	124—125
475,000	,,	Dec. 3	3	3	Do. 3 p.c. Deb. ...	88—92	...	...
285,344	,,	Aug. 13	5	5	Do. 5 p.c. Deb. ...	125—130	...	...
807,560	,,	Aug. 13	7	7	Croydon sliding scale ...	167—172	...	169—170½
569,590	,,	,,	5	5	Do. max. div.	116—121	...	118—121
620,385	,,	Dec. 17	5	5	Do. 5 p.c. Deb.... ...	130—135	...	...
843,270	,,	Aug. 13	10	7	Derby Con.	200—210*e*	...	...
55,000	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	100—105*e*	...	...
239,000	,,	Aug. 13	5	5	East Hull Ord. 5 p.c. ...	113—118	...	...
181,625	,,	Aug. 13	6	6	East Surrey Ord. 5 p.c. ...	140—145	...	...
175,800	,,	Dec. 17	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
1,002,180	,,	Sept. 10	†7	†5	European, Ltd.	120—125	...	121
10,313,481	,,	Aug. 13	5⅞	5⅞	Gas Light & Coke 4 p.c. Ord.	28/— 29/-*f*	...	27/11½—28/9
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	94—98	...	97½—97½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	110—113	...	111½—112¾
6,102,497	,,	Dec. 3	3	3	Do. 3 p.c. Con. Deb. ...	92—95	...	92½—94½
3,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	119—122	+1	120½—121
8,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	117—120	...	118½—119¾
270,466	,,	Aug. 13	6	6	Harrogate New Cons. ...	140—145	...	...
140,000	1	Sept 24	1/7½	1/7½	Hongkong & China, Ltd. ...	1⅞—1⅞	...	...
212,200	Stk.	Aug 13	5	5	Hornsey Con. 5½ p.c. ...	137—142	...	...
5,500,000	,,	Oct. 22	14	10	Imperial Continental Cap.	217—222	...	217—220
228,180	,,	Jan. 21	8½	3½	Do. 8½ p.c. Red. Deb.	91—96*	...	94½
235,242	,,	Aug. 13	8½	8½	Lea Bridge 5 p.c. Ord. ...	196—200	...	...
3,167,410	,,	Aug. 13	6	6	Liverpool 5 p.c. Ord. ...	145—147*b*	—1	...
245,500	,,	Dec. 17	5	5	Do 5 p.c. Red. Pref. ...	105—110*b*	...	...
806,083	,,	Jan. 16	4	4	Do. 4 p.c. Deb. ...	104—107*b* *	...	...
11,751	,,	Aug. 27	10	8	Maidstone 5 p.c. Cap. ...	188—198	...	...
68,480	,,	Dec. 17	3	3	Do. 3 p.c. Deb. ...	88—88	...	...
75,000	,,	Dec. 3	†10	†10	Malta & Mediterranean ...	205—215	...	...
393,000	—	Oct 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	102—107	...	...
231,978	Stk.	Aug. 13	5	5	M. S. Utility "C." Cons. ...	115—120	...	...
318,857	,,	,,	4	4	Do. 4 p.c. Cons. Pref. ...	101—106	...	105—106
260,075	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	102—107	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb.	127—132	...	...
125,000	—	Jan. 2	11/8	3½	Do 3½ p.c. Rd. Rg.Bds.	98—101	...	...
675,000	,,	May 28	†6	†13	Montevideo, Ltd.	55—65	...	59
2,061,815	,,	Aug. 13	6⅔	6	Newcastle & Gateshead Con.	26/8—27/3*d*/-	—/3	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	106—109*d*	+1½	...
776,706	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb. ...	100—102*d*	+1½	...
277,285	,,	Oct. 8	5	5	Do. 5 p.c. Deb. '48 ...	105—107*d*	...	...
274,000	,,	Aug. 13	5	5	Newport (Mon.) 5 p.c. max.	110—112*a*	...	...
204,940	,,	Aug. 13	7½	7½	North Middlesex 6 p.c. Con.	172—177	...	...
896,160	,,	Aug. 13	5	5	Northampton 5 p.c. max. ...	107—112	...	...
300,000	,,	Nov. 5	†7	†9	Oriental, Ltd.	168—173	...	171—172½
416,617	,,	Dec. 17	8	8	Plym'th & Stonehouse 5 p.c.	182—187	...	...
604,416	,,	Aug. 13	8	8	Portsm'th Con.Stk. 4 p.c.Std	185—190	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	112—117	...	...
114,000	,,	Jan. 21	5	5	Preston 5 p.c. Pref.	108—113*	—2	...
1,736,968	Stk.	Aug. 27	6	6	Sheffield Cons.	147—149*e*	...	...
95,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	100—104*	...	...
133,201	,,	Aug. 13	5	8½	Shrewsbury 5 p.c. Ord. ...	155—160	...	158
90,000	10	May 28	†4	†8	South African	3—4	...	...
927,177	1	Sep. 10	1/2⅞	1/2⅞	South East'n Gas Cn.Ld Ord.	30/—32/-	...	30/9
736,051	1	,,	-/10½	-/10½	Do. 4½ p.c. Red.Cum.Pref.	22/6—23/6	...	2a/9
450,000	Stk.	Aug. 13	74/4	4	Do. 4 p.c. Red. Deb. ...	102—105	...	...
6,709,895	,,	Aug 13	7	5	South Met. Ord.	137—142	—3	135—142½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	151—156	...	154½
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf.	107—110	...	109½—110
1,895,445	,,	Dec. 17	3	3	Do. 3 p.c. Deb. ...	91—94	+1	93—93½
1 000,000	,,	Jan. 7	5	5	Do. 5 p.c. Red. Deb.	118—121	+1½	119½—120
209,820	,,	Aug. 13	8½	8½	South Shields Con.	186—188*d*	...	...
1,543,795	,,	July 9	6	6	South Suburban Ord. 5 p.c.	145—150	...	140—149½
512,825	,,	,,	5	5	Do. 5 p.c. Pref.	124—129	...	125
300,000	,,	,,	4	4	Do. 4 p.c. Pref.	105—110	...	...
868,837	,,	Dec. 17	6	6	Do. 5 p.c. Deb.	129—134	...	131½—132
100,000	,,	,,	4	4	Do. 4 p.c. Deb.	107—112	...	...
647,740	,,	Aug. 13	5	5	Southampt'n Ord. 5 p.c. max.	118—123	...	...
121,275	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	102—107	...	...
350,000	,,	Aug. 13	5½	5½	Swansea 5½ p.c. Red. Pref.	114—119	...	...
300,000	,,	Dec. 17	6½	6½	Do. 6½ p.c. Red. Deb.	100—105	...	...
1,076,490	,,	Aug. 13	6⅔	6⅔	Tottenham and District Ord.	165—170	...	167½—168½
409,835	,,	,,	5⅔	5⅔	Do. 5⅔ p.c. Pref. ...	133—138	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	...
199,005	,,	Dec. 3	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
349,110	,,	Aug. 13	7	7	Uxbridge, &c., 5 p.c. ...	168—173	...	...
88,330	,,	,,	6	6	Do. 5 p.c. Pref. ...	124—129	...	...
1,326,700	,,	Aug. 13	7	7	Wandsworth Consolidated	168—173	...	170½—172½
1,371,378	,,	,,	5	5	Do. 5 p.c. Pref.	127—132	...	...
1,317,964	,,	Dec. 17	5	5	Do. 5 p.c. Deb.	130—135	...	...
208,300	,,	,,	...	26/8	Do. 4 p.c. Deb.	104—109	...	...
158,400	,,	Aug. 13	6*g*	5	Winchester W.& G.5 p.c.Con.	120—125	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g.*—Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

COMPANY NOTICES.

UXBRIDGE, MAIDENHEAD, WYCOMBE, AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given that the 74TH ORDINARY GENERAL MEETING of the Company will be held at 159-162, Palace Chambers, Bridge Street, Westminster, S.W. 1, on Friday, the 22nd day of February, 1935, at 2.45 p.m.

To receive the Directors' Report and the Accounts of the Company for the Year ended the 31st December, 1934.
To Declare a Dividend for the year.
To Elect Directors.
To Elect an Auditor and fix the Auditors' remuneration.
To Transact the General Business of the Company.

The STOCK TRANSFER BOOKS of this Company WILL BE CLOSED from the 14th to the 28th day of February, 1935, both inclusive.

NOTICE IS ALSO HEREBY GIVEN that an EXTRAORDINARY GENERAL MEETING of the Proprietors of the Uxbridge, Maidenhead, Wycombe, and District Gas Company will be held at 159-162, Palace Chambers, Westminster, S.W. 1, on Friday, the 22nd day of February, 1935, at 2.55 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary General Meeting of such Proprietors convened for the said date has been disposed of, for the following purposes:

1. To sanction the creation and issue of Capital of the Company authorized by the Uxbridge Gas Order, 1930.
2. To sanction the borrowing on Mortgage or the creation and issue of additional Debenture Stock of the Company any sums not exceeding in the whole Sixty per centum of the amount of the Capital for the time being, which at the time of borrowing has been raised.

By order of the Board,
GEORGE J. BRISTOW,
Secretary.

Uxbridge,
Jan. 25, 1935.

WINCHESTER WATER AND GAS COMPANY.

NOTICE is Hereby Given—That an ORDINARY ANNUAL GENERAL MEETING of this Company will be held at the Offices of the Company, 90, High Street, Winchester, on Thursday, 21st February, 1935, at 11.30 in the forenoon, to receive the Report of the Directors and the Accounts for the year ended 31st December, 1934; to declare a Dividend; and to transact the Ordinary General Business of the Company.

At the above meeting Mr. H. W. Warren and Mr. W. P. Richardson, two of the Directors, retire in pursuance of the provisions of the Act, and, being eligible, offer themselves for re-election. Messrs. Edmonds Clover & Ackery, the Auditors, also retire, and offer themselves for re-election.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 15th day of February to the 28th day of February, 1935, both days inclusive.

By order of the Board,
W. D. WALKER,
Secretary.

90, High Street,
Winchester.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is hereby given that the ANNUAL ORDINARY MEETING of the Proprietors of this Company will be held at the Abercorn Rooms, Bishopsgate, London, E.C. 2 (adjoining Liverpool Street Station), on FRIDAY, THE 22ND DAY OF FEBRUARY, 1935, at 12 o'clock noon precisely, for the following purposes:

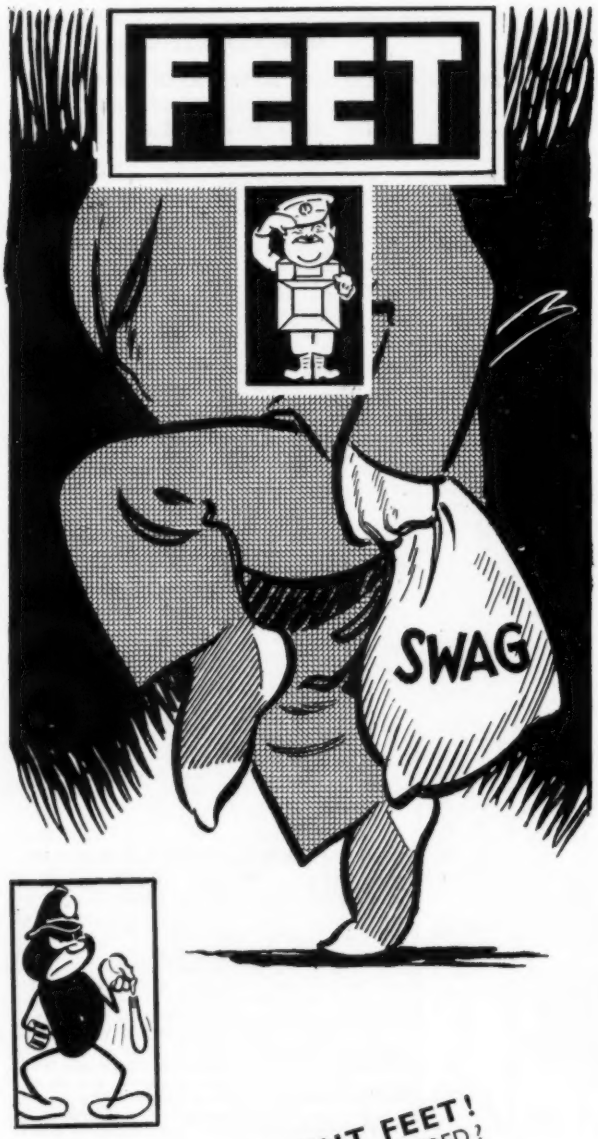
To receive the Report of the Directors and Statement of Accounts for the Year ended 31st December last.
To declare a Dividend for the Half-Year ended the same date.
To elect two Directors and one Auditor in the place of those retiring by rotation.
For general purposes.

AND NOTICE IS HEREBY ALSO GIVEN that, in accordance with the Standing Orders of Parliament, an EXTRAORDINARY MEETING of the Proprietors of the South Suburban Gas Company will be held at the same place at 12.30 o'clock in the afternoon of the same day or so soon thereafter as the business of the said Ordinary Meeting shall have been concluded, for the purpose of considering, and, if thought fit, of approving a Bill proposed to be introduced into Parliament in the present Session, entitled:—

"A Bill to confer further powers upon the South Suburban Gas Company; and for other purposes."

Dated this 25th day of January, 1935.
By order of the Board,
T. BROWN,
Secretary.

For further Company Notices see p. 329



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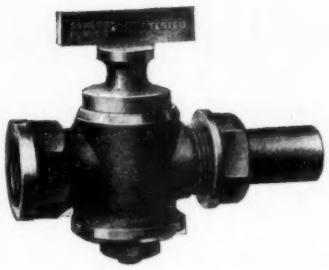

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MANCHESTER, 10
PHONE: COLLYHURST 2289
GRAMS: SAWER MANCHESTER